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b. EXPLOSIVE PUFFING OF APPLES

N. H. EISENHARDT
Engineering and Development Laboratory
Eastern Utilization Research and Development Division, USDA
(Philadelphia, Pa.)

Abstract*

A new development of the USDA's Eastern Division is quick-cooking, dehydrated fruit and vegetable pieces. The key to the quick-cooking feature is our explosive puffing technique.

Explosive puffing, applied at a critical stage in the dehydration process, imparts a permanent porous structure to the fruit or vegetable piece. This structure, as constrasted to the dense, misshapen pieces produced in conventional air drying, enables the rapid imbibition of water. For example, explosion puffed apple segments require only five minutes of simmering instead of an overnight soaking needed for most commercially dried products. Cost of the process is about 20% greater than conventional air drying; however, this is considerably less expensive than freeze-drying. Advantages of dried products are obvious, particularly if on reconstitution, the final product closely approximates the freshly processed material in color and flavor.

*A publication describing this process in detail is in preparation and will be issued in the near future. Copies may be obtained by writing Mr. Eisenhardt. The laboratory is located at 600 East Mermaid Lane in Philadelphia (19118).

In explosive puffing partially dried pieces are instantaneously discharged from above atmospheric pressure to the atmosphere. This resembles only to a degree, the gun puffing of cereal grains. Our gun has been specially built for use of fruits and vegetables, enabling the use of a lighter construction and consequently a greater capacity than in cereal puffing.

The explosive puffing technique has been successfully applied to such diverse commodities as apples, blueberries, carrots, white and sweet potatoes, beets, turnips, and rutabagas. Processing steps include: 1) preparation of the raw fruit or vegetable such as peeling, blanching, sulfiting and dicing or slicing, 2) initial drying to a lower moisture of 15% to 30%, 3) explosive puffing, and 4) final drying to a stable moisture, such as 2% for apples. Explosion puffed pieces, because of their porous structure, substantially reduced the time required in the final critical drying stage to a low moisture content.

c. APPLE JUICE CONCENTRATION BY THE SARGEANT ELECTRONIC PROCESS

ANTHONY LOPEZ and D. E. CARROLL
Professor of Food Technology and Research Assistant (respectively)
Virginia Polytechnic Institute
(Blacksburg, Va.)

An additional method for the production of a high-density apple juice concentrate might be provided by the Sargeant electronic concentration process.

This process was developed during the 1950's, and in 1960 was applied to commercial concentration of orange juice by Ralph Sargeant, the originator of the process.

A sevenfold orange juice concentrate is now produced commercially by the Sargeant process in the Lakeland, Florida plant of Universal Food Products. It is of excellent quality and has been consistently graded U. S. Grade A or U. S. Fancy for manufacturing. It is manufactured by a two-stage concentration process. In the first stage, the juice is concentrated to 55° Brix by conventional low-temperature steam evaporation. In the second stage, the 55° Brix juice is further concentrated to 72° Brix, or higher, by the Sargeant electronic unit.

The basis of the electronic concentration process is preferential transmission of energy by radio frequency at 10 to 30 megacyles to the water molecules so that water evaporates from the juice under a high vacuum. Some of the heat generated within the water molecules is transmitted by conduction to other molecules. This raises the temperature of the product and causes the evaporation of other volatile substances such as those responsible for apple aroma.

In terms of product flow, the process is as follows: The 55° Brix product, produced by conventional steam evaporation, is transferred over into the electronic evaporator. It is then pumped through the swept-surface heat exchanger to the electrode and flashed into the evaporator. To raise the product from 55° Brix to 72° Brix, 15 passes are necessary around the electrode-evaporator heat-exchanger system. Temperature of the product is 75°F at evaporation. Once the concentrate reaches a static balance at 75° Brix, the process becomes continuous.

I will now summarize some of our work on the concentration of apple juice by the electronic process.

Experiment I. In November of 1962, before a laboratory size Sargeant electronic unit was available, we transported, under refrigeration, 1,200 gallons of freshly produced apple juice to the Lakeland, Florida plant of Universal Food Products, Inc. There the juice was concentrated to 75% soluble solids using only the electronic stage of the commercial unit. All concentrate samples were immediately frozen and transported to our laboratory in Virginia. Different lots of the canned concentrate were stored at -10°F, 35°F, and 75°F.

No technical difficulty was encountered while concentrating the apple juice. The 75% soluble solids concentrate reconstituted easily with 7.3 parts water to give a single strength juice that possessed very good apple flavor. The following chemical and physical characteristics of apple juice were not changed by electronic concentration: color, pH, specific gravity, viscosity; and the amount of tannin, total acidity, reducing sugars, total sugars, and sucrose.

The only important change was the loss of a significant portion of the apple aroma naturally present in the juice. However, the concentrate retained its apple flavor even though it lacked the strong apple aroma of the original juice.

Storage stability studies showed that darkening in color of the concentrate stored at 35°F and 75°F was a useful index of product quality deterioration. After storage for four to five months, the 35°F concentrate was judged inferior in flavor to the -10°F concentrate by a taste panel in direct comparison of the two samples. At 75°F, the concentrate was judged as being unacceptable, flavor-wise, after storage for 35 days. The product, then, should be stored at 0°F or lower temperature.

A microbiological study was undertaken as no information was found in the literature on the behavior of microorganisms in high density apple juice concentrates. Plate counts were made each month on samples stored at -10°F and 35°F. The counts were also made on concentrate stored at 75°F for 20 days. Both a Standard Plate Count (S.P.C.) and a Yeast Plate Count (Y.P.C.) were made. The counts for the -10°F concentrate did not decrease over the 5-month period. The counts for the 35°F concentrate decreased from 2,400 per ml to 710 per ml from the one to the two-month storage period. The counts for the Y.P.C. continued to decrease during the remaining three months. The presence of viable yeast could not be demonstrated in the 75°F concentrate stored for 20 days

Substantially the same results were obtained with the S.P.C. as with the Y.P.C. The general trend of these results shows that the death rate of the microorganisms was temperature and time dependent.

Experiment II. Late in 1963, a pilot-plant-size Sargeant process unit became available to us in Lakeland, Florida. This unit can produce two gallons of 76% soluble solids concentrate on a batch basis. It approximates the process conditions attained in the commercial two-stage process.

Apple juice was concentrated to 75% soluble solids using this apparatus, and apple essence was added to the concentrate in a quantity equal to one-half the natural essence strength of the fresh juice. Consumer preference for the concentrate was compared with that for two commercial frozen apple juice concentrates, one a 6:1 concentrate and the other a 3:1 concentrate. Two leading commercial single-strength clarified and pasteurized juices were also included. This consumer preference study was statistically designed and run by the Special Surveys Branch, Statistical Reporting Service, USDA. Seventy-seven people participated in the study. Statistical analysis of the data showed that the differences for the mean scores for the five juices did not reach statistical significance at the 5% level. Thus, the results of this study give a good indication that the quality of a 7:1 concentrate produced by the two-stage Sargeant process is equal to that of apple juice concentrates or single strength apple juices available now on the market.

A retail price estimate that includes a 40% markup on wholesale price indicates that single 4-oz cans, that will reconstitute to one quart, can be sold for 20¢. The estimate includes the cost of adding apple essence and ascorbic acid to the 7:1 Sargeant process concentrate. This estimated retail price is approximately 33% less than today's price of an equivalent amount of frozen concentrated orange juice.

From the standpoints of product quality and production costs, the two-stage adaptation of the Sargeant process appears to have value as a method for manufacturing a 7:1 and higher-density apple juice concentrate products. For the production of 6:1 and lower-density apple juice concentrates, the Sargeant process and conventional methods appear equally advantageous on the basis of product quality and production costs. The Sargeant process, however, requires the use of additional equipment and therefore is at a disadvantage in this respect.

Recently we have been doing work on the possible effect of radio-frequency energy on pectin solutions. Results to date obtained on apple pectin, citrus pectin, and sodium polypectate indicate that the radio-frequency energy does not have any substantial effect on pectin solutions. This is interesting to us because we had reason to believe that it was in some way reducing the gelling properties of apple pectin and thus would allow the production of 7:1 or higher Brix concentrates from unclarified apple juice. More research is now being conducted in this area.

DISCUSSION

Ian Greenwood of Sun Rype Products in British Columbia indicated that his firm had put the USDA continuous-process press into commercial operation. He reported that the press had done as well or better than any other such press they had tried. Some remaining problems include 1) suspended solids, 2) need for a second press (the screw press hasn't worked adequately), and 3) a lack of sufficient capacity.

A representative of the Pet Milk Company stated that his firm had acquired the commercial rights to the Sargeant Process.

Addendum

A California firm, Test Laboratories, Inc., indicates that it has developed a "fresh apple powder which, when added to boiling water, makes instant apple sauce far superior to canned". The firm goes on to indicate that they can produce fresh apple slurry "as fast as the apples can go through the washer and be fed into the disintegrating machine". They state that "we can use all varieties and sizes". At present, they have plans to build a new freeze-dry plant in Yakima County, Washington for the production of this item.

2. DEVELOPMENT AND MARKET TESTING OF NEW PRODUCTS

a. DEVELOPMENT OF NEW APPLE PRODUCTS IN VIRGINIA

ANTHONY LOPEZ and D. E. CARROLL
Professor of Food Technology and Research Assistant (respectively)
Virginia Polytechnic Institute
(Blacksburg, Va.)

We shall discuss our developmental work on a number of new apple products.

Apple juice and grapefruit juice blend. The idea for an apple juice and grapefruit juice blend developed from our work on the Sargeant process. Dr. Johnson is going to tell you more about this product in the next talk. We would only like to mention that shelf-life studies on the canned, pasteurized, single-strength blend have shown no detectable flavor or color changes after 14 months at 75°F. The stability of the product, then, appears to be good.

In addition to the apple juice-grapefruit juice blend, several new apple products have been formulated and given preliminary laboratory evaluation. Among these are apple nectar, apple crush, applegel sauce, and canned apple salad.

Apple nectar, similar to apricot nectar, has a turbid appearance which can be obtained either by using unclarified apple juice or by adding to clarified apple juice particles of apple flesh that have been pressed through a fine screen. If desired, the sugar level of the product can be increased by adding corn syrup or other suitable sweetening agents. Laboratory data show that low-methoxyl pectin and calcium ions can be used to adjust the viscosity of the new product to a value similar to that of apricot nectar, and that the apple particles present will remain suspended. A low-methoxyl pectin content of 0.250% and 6.5 mg. Ca ions per 100 g., at a pH of 3.6 and soluble solids level of 13.2%, marked the point where all the apple particles were held in suspension. Samples with low-methoxyl pectin content between 0.250 and 0.45% were a soft, flowing gel. Beyond 0.45%, a solid gel was formed. The product can be formulated to have desirable viscosity and turbidity.

Apple crush is prepared by cooking apple slices either in steam or in a small amount of syrup until the slices begin to disintegrate. Cooking is terminated, however, while discrete apple pieces still remain. At this point, sugar is added to the apple mixture until the soluble solids content is adjusted to the desired level.

In a preliminary study, apple crush was prepared at various soluble solids levels between 20 and 40%. Equal quantities of mature Red Delicious and Stayman apple varieties were used, and the product was preserved by canning. A technical panel of six judges evaluated samples. The judges showed a definite preference for apple crush in the 28 to 38% soluble solids range; they commented favorably on the overall organoleptic appeal of the product, and especially liked the "lumpy" texture of apple crush.

Apple crush has commercial potential as a dessert item, and could be the answer to the market gap that canned dessert apples have not satisfied. Apple crush offers additional advantages as a new processed apple item. Among these: soft-fleshed apple varieties can be included in the blends used to prepare the crush, thus providing an outlet for "table varieties" such as Red Delicious; apple crush is suitable for use in a large number of household apple recipes, such as apple cobbler; and most apple processors could probably manufacture test packs of apple crush with present equipment, so the initial capital investment for production should be low.

Applegel sauce is similar to gelled cranberry sauce. The apples used are finely pulped to produce an opaque product. A characteristic and pleasing tartness can be developed by judicious blending of several apple varieties, and/or by adjustment of acidity by adding an edible organic acid and finally, by regulating the sugar content of the product. The product is gelled with low-methoxyl pectin. To increase its visual appeal, applegel sauce can be colored red or green with a U. S. certified food color. The product is preserved by canning.

Lazar and Morgan of the U. S. Department of Agriculture have also reported on a canned gelled apple sauce. They also used low-methoxyl pectin and calcium ions to achieve the gel, and they believe that his new product has excellent commercial potential.

Canned apple salad is produced by gelling apple juice, or blends of apple juice and other juices, with apple pieces and/or pieces of other fruit while regulating the sugar and acid content of the product. Gelling is achieved with low-methoxyl pectin and calcium ions. The salad is preserved by canning.

b. EVALUATING CONSUMER PREFERENCE FOR APPLE-GRAPEFRUIT JUICE

J. M. JOHNSON and ANTHONY LOPEZ
Professors of Agricultural Economics and Food Science (respectively
(Blacksburg, Va.)

While working with the apple concentrate which Dr. Lopez has described, the researchers conceived the idea for a blend of apple and grapefruit juices. They thought the two juices might be complimentary to each other in that apple juice is relatively high in soluble solids and low in acidity with a delicate flavor, while grapefruit juice is higher in acidity, and somewhat bitter, and lively in flavor.

With the two juices available to them, a combination of 22% grapefruit and 78% apple juice was judged most desirable. This and other blends of the two juices were tried out on several informal taste panels. Panelists expressed varying degrees of acceptance of the blend, but generally it was well liked.

Laboratory Evaluation

Next, seven separate panel tests were made at the USDA Sensory Evaluation Laboratory of the Special Surveys Branch in Washington, D. C. The first three tests yielded panelists' hedonic scale evaluations of different blends of apple and grapefruit juices. There was a consistent indication that preference values declined as more grapefruit juice was included in the blends. This did not support the hypothesis that some blends with highest preferences might be obtained. Two further tests were run using oranges and pineapple juice in place of the apple juice in blends with grapefruit juice. The results of both tests confirmed the effect of increased grapefruit juice in reducing preference for the blends.

Although the panelists' preferences were lower for the blends than for 100% apple juice, a sufficient number of panelists rated the blends high enough to indicate a possible market for them. A sixth test compared panelists' evaluations of 78-22% apple-grapefruit juice blend with frozen orange-pineapple, orange-grapefruit, and pineapple-grapefruit blends now on the market in sizeable quantities. The apple-grapefruit blend scored well below the orange-pineapple blend, slightly (though not significantly) below the pineapple-grapefruit blend, but well above the orange-grapefruit blend. The apple-grapefruit blend has the market advantage of being a blend of two of the cheapest fruit juices. This might overcome some preferences when it comes to market acceptance.

The final test compared an apple and grapefruit blend made with regular grapefruit juice with blends made from debittered grapefruit juice, an experimental product. The blend with debittered grapefruit juice was preferred by the panelists; but, increased proportions of grapefruit juice in the blend still reduced preference.

Field Evaluation

Further evaluation of the blend has been carried out in cooperation with the Florida Citrus Commission through a research organization which they retain. The work was in three stages: first, an informal in-depth interview with a panel of 8 to 10 homemakers in three different cities to determine their reaction to the idea, the product form, its taste and its appearance; second, an interview with random area clusters of 500 consumers in one city to obtain their reaction to the concept of the blend, to obtain demographic data for use in selecting a final panel of respondents to be given an in home test of the product, and to solicit their cooperation; and finally, in home use of two blends of the product for a week and a re-interview to determine attitudes toward the products and uses that would be made of it.

large amounts of cellulose, it seemed reasonable that acid hydrolysis might loosen the outer layers and permit their removal.

Preliminary tests with Red Delicious apples have indicated that the peel was loosened by exposure to acid fumes in a closed container from a 37% hydrochloric acid solution in a shallow dish at the bottom of the container. The fruit peeled readily after 45 minutes, 1 hour, or 4 hours exposure to the fumes; 15 minutes of exposure was not sufficient and after 6 hours of exposure the edible tissue under the peel was damaged. After loosening, the peel could be removed by brushing or rubbing.

The results seemed encouraging enough so that additional tests might be warranted. Certainly the method, if successful, would reduce peeling losses below those with mechanical peeling of some apple varieties. No estimates of costs have been compiled as yet.

Thick-Cake Extraction of Apple Juice

The engineers at Western Regional Laboratory have developed many pieces of equipment and new systems for the processing industry. A recent example is the two-state thick-cake dejuicing system for apples. The free run juice is extracted in a basket centrifuge and the pomace is repressed in a vertical screw press. This method not only eliminates the sanitation problems of the older rack-and-cloth press but gives higher yields at lower production costs. What more could you ask?

After grinding in a mill the apples go into a hopper, which automatically weighs the material into the centrifuge. The next operation, mixing of pomace with cellulose filter aid and the packing of a thick cake of the mixture on the walls of the centrifuge, is the key to this new process. About 60% of the weight of the apple is removed as clear juice in the centrifuge extraction. Juice from the vertical press can be recycled through the centrifuge to reduce insoluble solids, but it did not seem practical to operate in this manner.

A mobile pilot plant on a semi-trailer was constructed at the laboratory and towed to several California and Washington production areas for testing. In this manner the new extraction procedure could be compared side by side with conventional procedures in the various plants. From these demonstrations several processors became interested in using the method, and at least one commercial system has been in operation. Information on construction, costs, and operating variables may be obtained from the reference cited below or from our Engineering and Development Laboratory.

Gas Chromatography of Apple Aroma

During the development of highly sensitive equipment for gas chromatographic analysis of various food aromas in our laboratory, the vapors over the hot, crushed tissues of several varieties of apples were tested. Many volatile components were resolved and a continuing study shows promise for using this technique to "fingerprint" both qualitative and quantitative differences between varieties, effects of growing and storage conditions, and changes due to processing. It appears that the use of this method will be beneficial in analyzing and standardizing the aroma of a number of apple products.

The results of the informal, in-depth interviews were inconclusive. Responses ranged from highly favorable to somewhat unfavorable. An impression was gained that consumers might prefer a higher proportion of grapefruit juice in the blend and some lack of esthetic value of the appearance of the blend was expressed.

The preliminary interviews with potential panelists (471) also showed some lack of appeal of the concept, though no less than for several other blends that are now being marketed successfully. Thirty-one percent were completely uninterested in the product. These and a few others who did not wish to cooperate were excluded from the panel who used the product in their homes. As far as I was able to determine, no use was made of the demographic data in selecting the final panelists.

Each panelist was given two, 46-ounce cans of apple-grapefruit blend juice with differentiating labels, one contained 78% apple juice, the other 67% apple juice. The panelists were to try each of the juices over a period of a week or so at which time they would be reinterviewed. They were given a diary in which they were to record their family's reactions or comments.

Time does not permit a complete discussion of the study. It had many ramifications. Here are some of the most significant findings:

1. Of the 471 respondents at the initial interview, 69% thought they would sometimes make use of the product. About 31% could be ruled out as a market for the product just on the strength of the lack of appeal of the concept to them.

2. Only 9% of the 471 respondents thought they would serve the product frequently. These are potentially good customers for the product, but all may not buy.

3. When faced with a choice of receiving another can of product or 40 cents, 53% of the 309 panelists who tried the product accepted the product in preference to the money.

4. Of the 224 respondents who had used other juices or blends during the apple-grapefruit trial period, 16-19% liked the apple-grapefruit blend better than the other juices or blends that they had purchased. Some 40-50% liked the other juices or blends better than the apple-grapefruit blend.

5. The apple-grapefruit blend with either 78% or 67% apple juice (slight preference for 78%) has a potential market as good as many of the blends now on the market. It must have a strong name if it is to reach that potential or be included in a well-known brand line of products.

6. Appearance is not in its favor. Whether this can be improved has not been fully explored. Filtration during manufacturing would probably improve it.

* * *

The next logical move would be to test the saleability of the product in one or more markets over a period of two or three months. The trial should

be accompanied by a strong promotional program with store audits of the sales of it and competing juices and blends. Only then could it be recommended to processors with some certainty the market potential it would enjoy.

c. A REVIEW OF USDA'S MARKET TESTING EXPERIENCE WITH CONCENTRATED APPLE JUICES

P. B. DWOSKIN
Assistant Chief
Market Potentials Branch
Economic Research Service, USDA
(Washington, D. C.)

Our experience dates back to 1950 when we market tested a frozen 3-to-1 concentrate in Modesto, California, and Tyler, Texas. This was a high-quality juice of excellent flavor of which a major component was Washington State Delicious apples. From the sales data and the follow-up consumer survey, we predicted market success for the concentrate. The results also indicated that most of the sales of the new product were among consumers who were not users of apple juice.

About ten years later we market tested a high-density apple juice concentrate in Fort Wayne, Indiana. The results of this test reinforced the findings of the earlier tests, although in this instance, we were testing a 7-fold product based on the Eastern Laboratory's essence recovery method. The test demonstrated again that an apple juice of good flavor would gain ready acceptance from consumers. I might add that in this instance we were using Michigan apples. We didn't rely on our own evaluation or that of our cooperators on the fact that this was a superior juice. The fact was established by a series of well-designed and executed consumer panel and household placement tests. Thus, we knew in advance that our product was at least as good, if not superior, in flavor and quality to our competition.

The results of the USDA research experience in this area quite clearly showed that a good commercial market existed for a high-quality frozen concentrated apple juice. We are cognizant of the fact that until recently frozen concentrated apple juice was a comparative flop. While these failures were due to a number of reasons, a common thread running through all the post-mortems was that these products were no better, and in some instances worse, than existing single-strength apple juices. A concentrated frozen apple juice which is not better than that presently available in canned or bottled form is in serious difficulty as to its commercial future. While the image of quality is stronger in the frozen cabinet than on the grocery shelf, the quality has to be in the product if you are going to continue to sell it to the consumer.

The continuing interest in frozen concentrated apple juice is based on simple proposition that present apple juice consumption is confined to a relatively small segment of the population. These people are confirmed users of apple juice because they like the flavor of commercial single-strength apple juice, and are not particularly interested in switching. One of the key findings of our market testing experience, confirmed both

by the sales data as well as the household interviewing, is that a high-quality apple juice of better than average flavor and aroma is attractive to that large segment of the population not now using apple juice. This is where market expansion possibilities lies and its successful exploitation by the apple industry depends largely on one thing -- a high quality apple juice product with good flavor. To insure its success, the product must be differentiated from single-strength juices by selling it as a concentrate and given a quality image by selling it as a frozen juice.

To summarize, our market test experience on apple juice concentrate indicates:

(1) A substantial market exists for a high-quality apple concentrate superior in flavor and aroma to presently available single-strength apple juices.

(2) The product should be sold as a concentrate and in the frozen form.

(3) The product has its greatest appeal among the large bulk of the consuming public that does not now buy or use any apple juice products.

d. MARKET TESTING FRUIT JUICE POWDERS

W. SMITH GREIG
Associate Professor of Agricultural Economics
Michigan State University
(East Lansing, Mich.)

About a year and a half ago Michigan State University initiated some work to market test fruit juice powders. Fortunately Phil Dwoskin has an interest in the project and we have agreed to work together on it. Basically we want to determine the potential for fruit juice powders as a summertime drink for children. Presently we are working on some preliminary market tests of apple, cherry and grape juice powders. We may also add orange juice powders as we feel we need a broad product line if we are to compete with the synthetic drinks for children.

Tentatively, we feel we will have to market a drink, not a pure juice. Also we know we cannot compete on a price basis but will have to compete on a quality basis. We do not feel we can capture a major share of the synthetic market but hope we might capture a portion large enough to warrant commercial production of the products. We feel that any portion of the market captured will be nearly a net additional market for fruit products.

Fruit juice powders, of course, have market potentials in addition at the children's drink market. Here I am thinking more in terms of the military, cake icings, pudding mixes and confectionary items. These latter markets I feel can perhaps more appropriately be tested and developed by private processors.

A status report of our project is as follows: We have shipped concentrated apple, cherry and grape juice to two laboratories for preparation of fruit juice powders by two processing technologies. The Eastern Regional Research and Development Division of USDA, Mr. Roderick Eskew's group, has processed powders for us by an adaptation of the foam-mat drying process which was developed by the Western Laboratory.

We plan to compare the products through a consumer panel in Detroit, Michigan in April. Later we would like to conduct a major market test, such as the one Phil Dwoskin described for the superconcentrated apple juice on the most preferred products.

At this stage we do not have a formal project statement but we have informal commitments for most aspects of the test except one necessary aspect and that is advertising and promotion funds for the products during the market test.

We think there is a good opportunity here to take a series of new fruit products from the laboratory developmental stage into pilot line production and on to a comprehensive market test. We feel that these steps can be very useful in encouraging commercialization of new products and in expanding the total market for fruit products.

3. INDUSTRY EXPERIENCE WITH NEW PROCESSES AND PRODUCTS

a. A CONCEPTUAL FRAMEWORK

DANA G. DALRYMPLE
Economist, Fruit and Vegetable Marketing
Federal Extension Service, USDA
(Washington, D. C.)

The overall goal of industry is to maintain or strengthen demand for a commodity so that industry income may be maintained or increased.

Maintenance of demand can be important because of dynamic and competitive nature of the market. A firm has to do a certain amount of running to keep up with the crowd. This is true for all industries but is a particular problem for agriculture because it has less control over output.

Increase of demand involves pushing one step further: to improve rather than maintain existing position. An expansion of demand means that:

- more of the product will be purchased at the same price, or
- the same quantity will be purchased at a higher price, or
- some combination of the two (somewhat higher quantity at somewhat higher price)

Situation for Apples

The particular problem faced by apples is that with increased production we may need to sell more processed apples -- at the same or preferably a higher price. How do we increase the quantity sold and at least hold the price? This can be accomplished by:

- getting existing buyers to purchase more
- attracting new buyers

Translated into marketing strategy, this means:

- moving more of existing products

- moving new products into consumption

It is doubtful that either route could carry all of the prospective increase in production -- or whether each by itself would be the most efficient way to do so. Both need to be involved.

To move existing products the primary approach would seem to be additional or new promotional techniques. This area has already been discussed. Another approach might be to improve the quality of existing products; this area will be covered in the next session of the conference.

New products could appeal to both existing and potential buyers. They call, however, for development and promotional work. Both cost money. But attention here might pay as well as efforts to move existing products -- particularly in a highly competitive and innovative society.

Qualifications

There is, however, the possibility that some new apple products may just substitute for existing apple products. To the extent that this happens, it may reduce the benefit to the entire industry (unless costs are cut in the process).

How is this likely to happen? There are four main categories of products: sauce, slices, juice, and cider. Because of the different end uses for each, I doubt if there will be much substitution between categories. If there is some substitution, it is more apt to be within -- say between canned, frozen, dried, and fresh forms of slices.

But even if some substitution exists, it shouldn't blind us to the possibility that expansion of the total market may well be going on at the same time. And if the older apple products are not replaced by newer apple products, perhaps they will be replaced by non-apple products.

So far I have been talking about the industry as a whole. What is best for the industry may not necessarily be best for an individual firm. That is, there are some firms who may not benefit from conducting an individual new products program. Costs are involved. Moreover, some firms producing traditional products may find themselves competing with new products. But there are some firms -- and perhaps there could be many more -- who do benefit substantially.

* * *

In total, I think that the industry as a whole can only benefit from high quality new products. At the individual firm level the situation can be more mixed -- but with the possibility of a good payoff for the firms involved. We shall hear next of the experiences of some firms who have gotten involved in new products.

b. DEHYDROFROZEN APPLES

BILL McINTOSH
William E. McIntosh Co.
(Geneva, N. Y.)

One of the results of our continuing efforts in New York State to improve the quality and convenience of our products is the dehydrofrozen apple slice. This new product is made by dehydrating apple slices under controlled conditions to insure superior quality. These slices, reduced approximately 50% in weight and volume, are then preserved by freezing. This combination of processes is called dehydrofreezing.

Dehydrofreezing is a patented process; the patent is held by the Department of Agriculture and is dated 1949. The William E. McIntosh Company brought this process into New York State in 1951 and started work on its commercial implementation. In 1956, dehydrofrozen apples appeared in significant quantity in the commercial market. The period from our beginning to the first commercial breakthrough, therefore, was five years. The first large user was a bakery chain; the firm has continued to use this product almost exclusively since 1956. It took another five years to interest a second very large bakery chain in the advantages of this product. Since 1960, other users have taken this product in increasing amounts and our estimate is that for the pack year 1965 better than 20,000,000 pounds, rehydrated weight, will be packed and sold. There are now seven dehydro processors in New York State and dehydrofrozen apples have become an item of importance for the slicing industry in our state.

The controlled conditions under which we are operating involve:

(1) Sulphur treatment of slices to prevent browning with sulphur retained in rehydrated product only 65 P.P.M.

(2) Temperature of product in air dryer below 140° insuring a fresh-like product, not to be confused with long term drying where time and temperature actually change product flavor, but controlling temperature so that product temperature is below 140° at all times.

This New York State product offers the baking and manufacturing industry several distinct advantages. They are:

(1) Highest quality -- an appealing flavor, an unsurpassed taste, and uniform texture (according to research studies conducted by the USDA and Michigan State University). Baked goods made with dehydrofrozen apples are preferred by bakers and consumers.

(2) Competitively priced -- comparable or lower cost per pound than other forms of apple products. Savings in packaging, storage and transportation.

(3) Convenience -- easy to use, less trouble and easily stored.

(4) Product contains no sugar -- excellent for dietetic foods. No freezer space is required for sugar, no freight, no container, no investment in sugar.

(5) Versatile -- product is suitable for all bakery products requiring apples.

(6) Better moisture control when used in manufacturing food products.

We think there are two important observations to make about this product:

(1) For the manufacturer who wants full flavor and who is using a frozen product, this represents the one process that can be used by most every customer and is the one process which seems to work with the greatest number of apple varieties under the widest range of texture variation.

(2) The opportunity for the dehydrofrozen industry to deliver measurable solids appeals to the cost-conscious buyer, as this represents the only frozen process where the product can be sold and delivered on an apple solids basis. All of the other frozen products are involved in the drained weight hassel with no chance for the processor to make effective controls on apple solids.

We feel that dehydrofrozen apples will continue to pick up a growing share of the total remanufacturing market and that user's costs will decline as the quality of their product improves.

c. APPLE JUICE CONCENTRATE

AUDY MURCH*
A. F. Murch Co.
(Paw Paw, Mich.)

New processes and new products are being developed so fast that before one can get a plant assembled today, some of it becomes obsolete. The days of just canning or freezing fruit are almost passe. These new processes and products are opening up many new markets and I think the surface is only scratched in the apple processing field.

The days of producing only one product in a plant from apples are gone. This fruit must be utilized by the production of several products. Every day new uses for apple products are being opened up by food manufacturers who are not prime processors. We who process apples must come up with something besides apple sauce, apple slices, apple juice or apple concentrate if we are to open up the new markets we so badly need for utilizing the predicted apple production in the next few years.

Our Company extracts juices and concentrates juice and puree. From our point of view when we buy fruit we are purchasing four ingredients that we will process in producing an acceptable product from the fruit. I would list them in this order of importance: flavor, soluble solids, color, and pulp (which includes the skin or peel). Most of that which we purchase in fruit is water. Singularly, and in various combinations and forms, these ingredients make up the products we produce.

In our patented juice extraction process we employ no presses or centrifuges. We extract juice and filter in one operation by using a vacuum filter after

*Mr. Murch was unable to attend the Conference because of illness. He did, however, submit this paper.

mechanical disintegration of all of the juice cells in fruit. We strip flavor from the whole fruit before the juice is extracted.

We know we have only scratched the surface in processing apple ingredients that can be incorporated into new items. Last year, by accident, we produced about 25 gallons of apple oil. This comes out of our production at the rate of ten parts per million. We sold it to deer hunters in this aerosol can. This one can will keep a hunter smelling like a walking apple tree for the duration of the hunting season. It contains 4 oz. which is made up of 87% mineral oil, 10% alcohol, and 3% apple oil. This may be a little like salting the deer's tail, but it got rid of a by-product and we had a lot of laughs with it. Without doubt, there are several other uses for this oil which comes from the peel.

I am sure that in the very near future there will be many new things learned about apples and their utilization will be in many new products that are completely foreign to us today.

J. E. KLAHRE*
General Manager
Tree Top, Inc.
(Selah, Wash.)

Tree Top's entry into frozen concentrated apple juice dates back to 1961. In that year, Mr. Charbonneau, former owner and manager of the firm, started construction of a concentrating plant using the USDA Eastern Lab concentrate process with an essence-recovery unit. It was expected that the plant would be ready to go into operation in 1963. Mr. Charbonneau thought that the following year the firm could give up its single-strength operation and turn completely to concentrate.

As it turned out, the plant went into operation later than expected in the fall of 1963. The juice was introduced in markets where Tree Top single-strength juice was well-known. The reaction was mixed, but on the whole consumers did not appear to be willing to pay the price that was being charged. The price has subsequently been dropped, and the product is moving at a price that will return the growers a little more for their apples than single-strength juice. Significantly, the concentrate appears to appeal to those who didn't use single-strength juice; therefore, it is able to reach into new markets.

At present the concentrate has wide distribution and is undergoing a slow but steady increase in demand.

d. DRIED APPLES

WALLACE J. MILLER
Food Technologist
Valley Evaporating Co.
(Chelan Falls, Wash.)

Recently we have added belt through dryers and drum dryers to our production facilities. These have both contributed, and are contributing, to a growing

*Prepared by Dana Dalrymple from notes taken during Mr. Klahre's talk.

volume of apples dehydrated.

The belt dryers are limited to production of diced pieces, but these are convenient to use in many bakery specialty products and as an ingredient in convenience foods. The dices are cut in any one of several sizes for specific products, depending on size and rehydration characteristics desired. We are increasing production of apple dices, dried and dehydrated, each year.

Drum dried apple flakes have been in production for more than a year and production is being increased for the coming year. These dryers efficiently reduce a sauce to an apple flake or a powder that can be used in cake mixes, cereals, or as an instant sauce.

We are interested in future production of osmotic dried and explosion puff dried dices, but supplies of raw material are not yet abundant enough for us to go into these products.

First we will further expand drum drying and dice production, and then possibly make a start on osmotic or puffed pieces, as we see our supply of raw material increase.

WILLIAM D. JACKSON
Director of Marketing
Vacu-Dry Co.
(Emeryville, Calif.)

You have heard of many new or modified processes and methods of changing properties of apples to meet new markets. We work very intensively in this field in an effort to capitalize on the inherent properties of apples and introduce them into new markets. We dehydrate apples by a variety of processes such as air, air belt, and vacuum. I will confine my remarks to low moisture dehydrated apples. A number of these items are on display.

New Products

You may have noticed our Instant Apple Sauce. We think this is a high quality apple sauce possessing a freshness in flavor unique to this product. I hope you are able to taste it. We think it tastes very good; in addition it possesses certain savings in weight and cube that have many unique applications. Of course, one large user is the military services but there are many industrial users too. The product is not on the retail shelves as we do not believe the housewife can utilize its inherent advantages. After all, canned apple sauce is a real bargain item in most retail markets.

Two new retail products which use apples are: Kellogg's Apple Jacks, a new fruited cereal concept; and General Food's Toast'em Pop-Ups, apple flavor. Both are applications of dehydrated apple products. Both contain some apple solids. They should be on your grocers shelves now.

Bakery Market

For years we have been pushing dehydrated apples into bakery products. Here we compete with canned and frozen apples. However, our dehydrated products

possess certain inherent properties that meet many specialized applications. This is a very specialized use of dehydrated apple products.

You may have noticed the variety of cuts of apples that we find necessary to meet the performance characteristics of this market. You will see apple slices, nuggets, and other cuts down to apple powder.

The bakery market is very price conscious; bakers shift from frozen apples to canned apples to dehydrated apples and back and forth, always looking for bargains. Many bakeries use all forms of apples, including fresh peeled and cored. Each form of apple has certain advantages and disadvantages. This is a very large volume market collectively and I am sure all processors are pushing it constantly.

New Markets

Many of these processed apple products will grow with the population growth. To get new large markets you need new products.

Several years ago we made an apple snack item for Colgate, which they test marketed as Snapples. This was a very good product but it was expensive to manufacture. Raw material was expensive and as it must compete with other snack items such as potato chips, crackers, cookies and pop corn, and salted nuts of various types. We have as of this date not been able to solve this economics of the product.

Introducing new products is an expensive program. Here the grower is supplying part of the raw material. He assumes only a part of the risk inherent in any new product. Therefore, and I am speaking now as a processor, he is not entitled to the margin of profit that he obtains from selling his commodity for the fresh market where he takes considerably more risk.

The development of new products utilizing processing apples can substantially increase the consumption of the apples but only when the price and availability of processing apples attains some stability from year to year.

C. FACTORS INFLUENCING FINISHED PRODUCT QUALITY AND COST

1. INFLUENCE OF RAW PRODUCT FACTORS

a. MECHANICAL HARVESTING

JORDAN H. LEVIN
Leader, Fruit and Vegetable Harvesting Investigations
Agricultural Research Service, USDA
(East Lansing, Mich.)

Finding labor to harvest apples has become a major problem in all apple producing areas of the United States. Growers are therefore considering mechanical harvesting. Without a doubt, during the 1966 season a number of growers will harvest some apples for processing outlets by mechanical means.

We do not know what type of equipment will be used nor what methods will be used. It is important that processors stay close to the developments so that they will not only be prepared but will help determine the systems that will be adopted. Doing so will enable the industry to move into mechanical harvesting smoothly and without hardships.

It has been demonstrated by several research groups that apples can be mechanically removed from the trees with a minimum of labor by tree shakers. During both the 1961 and 1962 seasons, the USDA in cooperation with Michigan State University used a boom type shaker in harvesting about 25 trees each year. This work was done at Ludington, Michigan. The results showed that it would be possible to easily shake the apples from 20 trees onto the ground in an hour. The results also showed that with the catching frames available that we could harvest 12 trees an hour. The number of personnel involved would be four people -- which means four people could harvest 200 to 250 bushels per hour. Picking by hand would take approximately 25 to 30 men to do this. Therefore, there is no question that labor can be reduced -- one man could do the work of five or six.

Some research conducted at the Rodney Bull Orchard, Bailey, Michigan, in the 1963 season showed that practically all bruising except that which occurred when apples hit limbs, could be eliminated by using proper collecting equipment. This equipment would have all hard surfaces padded and use decelerator strips to keep fruit from hitting other fruit. Decelerator strips were first used by the USDA in California for harvesting peaches. Other methods of cushioning such as air bags are now being developed for catching soft flesh fruits.

During the 1962 to 1963 season, 4,528 pounds of apples were shaken onto decelerator strips and allowed to fall onto the ground. These were placed in storage three months and then processed by Cherry Growers Inc., Bailey, Michigan, into frozen slices. The results showed a reduction in yield of 11% and an increase of labor cost for processing $1.50 per ton (see Table 1.) The grade of apple slices of hand picked and machine picked were both Grade A as determined by a federal-state grader.

Table 1. Processing Results, Ontario Apples, 1963

	Machine Picked		Hand Picked	
Ciders	829 lbs.	----	868 lbs.	----
Rots	378	10.2%	176	4.0%
Cores & Trim	1,527	41.3	1,621	36.2
Yield of Slices	1,794	48.5	2,677	59.8
Total	4,528 lbs.	100%	5,342 lbs.	100%

During the 1963 to 1964 season we were interested in what would happen under the least optimum conditions. In September 1963, five bulk boxes (4,500 lbs.) of McIntosh apples were hand picked for unpruned, old trees. Five bulk boxes (4,250 lbs.) were harvested from the same block with a tree shaker. The ten bulk boxes were kept in CA storage until April 1964 (7 months). The apples were then run over a grades and packed for fresh market (none of the processing plants were running at that time). Results are shown in Table 2.

Table 2. Packout Results, Spys, 1964

	Machine Picked		Hand Picked	
Ciders-10 bu. x 44	440.0 lbs.	10.3%	462.0 lbs.	10.3%
C-grade under 2 1/4	682.0	16.0	536.8	11.9
C-grade over 2 1/4	2,274.8	53.5	1,221.0	27.1
#1= 16 11/12	634.0	14.9	2,265.7	50.3
Rots	220.0	5.2	15.0	0.3
Total	4,250.8 lbs.	100%	4,500.5 lbs.	100%

About 5% less apples were suitable for processing from the machine picked than from the hand picked. However, 1,000 pounds more apples would have needed trimming if they were processed -- which would have meant a substantial slowing down of the processing line.

During the 1965 harvest, an inertia type shaker mounted on a low profile catching frame with decelerator strips used. Appled from trees which were under 40 years old were harvested. Varieties consisted of McIntosh, Greenings, and Grimes. The apples were stored outside for about four to five days and processed into apple sauce at the Paw Paw plant of the Musselman Division Pet Milk Company. The results are shown in Table 3.

Table 3. Processing Results, 1965

	Machine Picked	Hand Picked
Chips	1.85%	1.35%
Finisher Waste	2.07%	3.03%
Lbs./Cs. #2 Basis	32.72 lbs.	33.12 lbs.
CS./Shift Hour	610.0	655.0
Defects Needing Trimming	41.8%	9.0%

The quality of the sauce was the same for both methods of harvesting. However, the large amount of shaker picked apples which needed trimming slowed down the operation considerably. In the McIntosh variety which was machine picked, 47% had bruised spots and needed trimming. However, with Grimes Golden which were mechanically harvested, only 14% needed trimming.

Our results can be summarized as follows:

(1) Frozen apple slices and sauce of equal quality to that made from hand picked apples can be produced with mechanical harvest apples.

(2) Bruising can be held to slightly more than hand picked fruit provided the right type of equipment is used. However, this equipment, at least at present, will be expensive and growers may use equipment which will result in bruising of various amounts.

(3) Mechanical harvesting with tree shakers brings down all the fruit on the tree and therefore there is more small size fruit.

(4) The seriousness of the bruising depends on how long the fruit is stored and the type of storage. It also depends on the variety being harvested.

Processors would consider buying their fruit on size. They should work out methods for scheduling fruit for receiving whether directly from the orchard or from storage.

Mechanical apple harvesting equipment and especially methods may undergo a number of changes in the next few years and processors must keep up and be a part of the new development.

R. L. LaBELLE
Associate Professor of Food Science
New York State Agricultural Experiment Station
Cornell University
(Geneva, N.Y.)

The harvesting of apples or any other tree fruit by shaking is a development hardly more recent than the first small boy. What is new about it are serious attempts to achieve practical production rates in removing the fruit by mechanical shaking and to catch and collect it in bulk boxes without excessive damage. Since harvesting has not represented so great a part of apple production costs as in smaller fruits, this development has not received the attention one might expect, considering volume of production. Recent and continuing shrinkage of the labor supply, however, has awakened keen interest among growers and processors in the mechanical harvesting of apples. Fortunately, the ground work has already been laid, chiefly in New York, Michigan, and Massachusetts.

The possibility of excessive fruit damage in mechanical harvesting is of major concern to this group. The apple industry has been trying to reduce just such damage in conventional hand-picking and subsequent handling. There is a certain tolerance for damage in processing apples because most of it is peeled, thereby removing shallow injuries without extra loss of material or expensive hand trimming. Further reduction in trimming cost can be obtained by peeling more deeply, but then only at the expense of yield.

The extent and color of a bruised area, together with consideration of the specific product, determine trimming needs. Apple sauce provides more leeway than slices because the finisher, when properly adjusted as to speed and screen size, may expel much of the cohesive bruised tissue. In our pilot plant work we were able to ignore all light brown bruises of whatever size when making sauce and to trim out only those greater than a half-inch in diameter when processing slices and still arrive at Grade A products. However, we were careful to remove very dark tissue, decay or rot, and blossom-end debris.

The research program at Cornell has been centered around mechanical harvesting equipment developed in the Department of Agricultural Engineering. The Department of Food Science and Technology at Geneva participated in tests on this equipment by taking samples from the harvester sufficient for pilot plant processing. This fruit was then stored in both common and cold storage for six to ten weeks, and processed into sauce and slices.

These products proved in the main to be Grade A when officially judged by the processed products inspectors. This was despite the fact that the machine-harvested fruit had a higher count of bruises than did the experimental hand-picked control. The latter were much better than the average hand-picked apples found in the plants -- at least by the time they arrived at the peelers. In fact, bruise counts for experimental machine-harvested fruit had the same range and average -- about 15 to 65 bruises per 100 apples with an average of 40 -- as did apples observed in a number of processing plants. There is some indication, here, that post-harvest handling has in practice a considerable influence on the final level of damage found in processing apples.

In our tests the mechanically-harvested apples stored in bushel crates kept very well. Greater counts of rotten apples were found in common-storage fruit, the decay originating mainly in punctures and other skin breaks. This decay was much less extensive in apples held for longer periods in cold storage. However, bruise counts were somewhat higher, suggesting that even in small bruises a slow extension of the affected tissue occurs as storage continues.

Finally, limited tests of mechanically-harvested apples by three different processors in as many years have been encouraging. Small deliveries of experimentally machine-harvested fruit involving several bulk boxes of Rome or Rhode Island Greening apples have been run through commercial processing lines where they have compared favorably in yield and quality with the ordinary hand-picked fruit in use.

There seems little question at this point that mechanically-harvest apples will be readily usable in the processing plant. With the introduction of deceleration strips, foam padding, and workable bulk box loaders, design of the necessary harvest equipment -- which is still very much in flux -- revolves more upon fitting the machine to the topography of the orchard and the geometry of the tree. Usable designs already exist, though the price of the many mechanical features required for efficient operating and low operating cost comes high. Modification of the tree itself, at least in new plantings, is seen as necessary to reduce the cost of solving some of these mechanical problems.

b. REGULAR AND CONTROLLED ATMOSPHERE APPLE STORAGE

FRED W. BURROWS
Executive Vice President
International Apple Association
(Washington, D. C.)

Change is inevitable. In the apple processing industry we've witnessed a sharp increase in processor holdings of apples in storage. According to IAA storage holdings data, reported processor holdings on November 1 have increased from about 6 million bushels (1/8 of total holdings) in 1960, to nearly 11.5 million (over 1/6 of the total) in 1965. The specific data are reported in Table 1.

Table 1. November 1 Apple Storage Holdings
(thousands of bushels)

	Total Holdings	Processor Holdings	Processor as Prop. of Total
1960	49,003	5,981	12.2%
1961	56,591	7,944	14.0
1962	58,644	9,034	15.4
1963	65,158	9,105	14.0
1964	65,135	9,879	15.2
1965	64,526	11,489	17.8

Factors Influencing Holdings

The major contributing factors influencing increased processor holdings are labor, waste, and improved quality of the finished product. The processor simply doesn't have the facilities, nor the manpower to process the increasing tonnage of fruit available during the harvest period. To put it in piles in the orchards or around the plant means heavy waste and an inferior product. The need for more orderly handling and extension of the packing season was and is apparent.

Therefore, several processors have constructed new storages, or acquired existing facilities, and have stored larger and larger tonnage of fruit. More importantly, they have made increasing use of grower-owned storages to hold fruit purchased or committed during, or shortly after the harvest season, for later processing. A few processors have directly reversed the "normal" process or "psychology" of processing as hard and fast as possible and are storing substantial tonnage for processing into March. This extends the use of their facilities and labor force over a longer period of time. In the future, availability of labor and the cost of labor, may be the major determining factors in forcing processors to store more fruit.

Role of Packing House Culls

Two changes that have affected the processing pattern and may be an even greater factor in the future, are (1) the nearly universal practice in the East of storing tree run and packing fresh on order, and (2) the continued expansion of CA storage. Another important point is the fact that growers in the processing areas have planted colored sports of dual purpose varieties (varieties suitable for both the fresh market and the processing market).

As the tree run fruit is packed out of storage for the fresh market, a fairly substantial tonnage of packing house culls is available and needs a "home". The processor is the most likely volume user. Truckers are another outlet, but are declining. This means the processors have an unknown tonnage that will become available during the storage season at unknown price. This situation certainly influences the processors' thinking when he sets a price in the fall and affects his commitments for tonnage at that time.

With more fruit going into CA and, therefore, an additional tonnage of packing house culls available to the processor right into May and June, this problem may be accentuated. It can be solved by close cooperation between processors and growers.

Seasonality of Pack

With increased processing holdings in storage and the increased availability of packing house culls from storage, we expected that the volume of slices and sauce packed after January 1 in recent years was greater than in earlier years. An examination of National Canner Association data for the past ten years shows that this is reasonably true, but the percentage of the total sauce pack packed after January 1 has not increased due to steadily larger total packs.

JOHN B. PETERS
Vice President
Knouse Foods, Inc.
(Peach Glen, Pa.)

Other things being equal, the maturity of an apple has a direct bearing on the quality of product it is capable of producing. Fruit coming directly from the trees, if mature but not over ripe, has a potential for producing high quality products. The apple processing industry was built on the idea of using apples direct from the orchard or from a harvest packing operation. This fruit was used immediately by processors as far as possible. This system set a pattern for quality and cost. The surplus deliveries were piled in bulk in the open or in buildings. Such fruit -- depending on seasonal temperatures -- matures, ripens, softens, even rots quite rapidly. Processors have found that fruit so piled from one to possibly six weeks (depending on variety), would generally become too undesirable from a quality standpoint to put into a production budget.

The cold storage originally planned for fresh apples has gradually come into the picture. And it came into the picture originally not because of any recognized effect on quality, but rather because of its usefulness in extending the supply of fruit. The early storages usually did not conserve quality to the extent that the newer storages do. Within the last 15 years new cold storages have come into use that quickly and constantly control fruit temperature. These storages now make it possible for processors to deliberately hold fruit in good processing condition at least three months longer than is possible without refrigerated storage.

The use of CA storage -- the probable next step in holding quality processing apples -- is rather new in the field. It is too new with respect to large

scale storing of processing apples on a commercial basis to provide a complete answer. Maturity factors enter this type of storage to an evan greater extent than they do in either fruit fresh from the tree, piled, or cold stored. However, we do believe that CA storage ideally might prolong the quality in processing apples for at least three months beyond the life of regular cold storage fruit.

These guide lines, by the way, have been come by the hard way for processors. Cortlands, Jonathans etc. need to be used from outdoors around October 1, later apples by November 15th. Similar varieties may be stored until January to March 15th. CA may come in at this point.

The cost of apples is more readily visible than quality. As I said earlier, the processing industry was built on the use of fresh picked and open piled apples. In addition to the cost of using apples fresh from the trees, the piled apples had the labor of dumping and the labor of reloading added to them. Then, too, they had the damage of two extra handlings. Also, they had a definite amount of deterioration, shrink in weight, and loss in decay. These additional costs for piled apples were all accepted 30 years ago. They were in the processor costs in some cases within the last ten years.

With increasing competition and higher costs, especially labor costs, as well as an outright scarcity of labor, the processor has been forced away from dumping apples in piles. It is cheaper to stack fruit in bins. It is still cheaper to store apples in good cold storages. Apple products can be produced in January and February from properly cold-stored fruit for less money per case than fruit dumped and piled out-of-doors until November 15th. In addition, its quality may be comparable with that of fresh picked fruit where that from the piles may be of such quality that it has to be "Fire Saled" by the processor.

Processors are coming to own some cold storages, many are depending on others for this service. Growers generally provide these facilities. Canners often hope to shift the cost of storage to the grower.

W. J. KLOTZBACH
General Manager
Cherry Growers, Inc.
(Traverse City, Mich.)

Let me preface my remarks with the statement that <u>product yield</u> is a primary determining factor in a processor's use of various mechanical means to improve the quality of his finished product at a competitive cost. There can be no compromise on his part in his company's quality standards once the grade and quality the company wishes to market has been determined. The need to achieve this uniformity of quality is of the utmost importance in making a decision whether controlled storages should be used by the processor, for without a uniform high quality raw product, it

is impossible to produce uniform quality in the finished product. This is particularly important where the end product is a frozen apple slice.

Product yield is strongly influenced by the control exercised over the raw apples that are to go into the finished product. Both regular and controlled atmosphere storage permit much better control over raw product quality than is true of common or yard storage. The question always arises: "Is this economically practical for the processor?" I want to discuss with you today our experiences over the past season and will attempt to give you some very limited data which could be significant.

Cost Data

In our operation, we are processing both frozen apple slices and canned apple sauce. About one-half of our total supply is put into frozen apple slices. I don't have any data on storage of fresh apples for use in apple sauce. My figures, therefore, apply only to our frozen slice pack.

During the 1965-66 season, only 12% of our apples were from common or yard storage. In yard storage, only those varieties thatwere suitable for immediate utilization should be considered. There may be certain maturity conditions that would make further storage impractical. Apples that are bruised or out of condition should not be stored. In regular cold storage, it is practical to store only apples in prime size and condition. By this, we mean apples that would run at least 50% 2-3/4¼ up and having 15-18 pounds pressure with a minimum of bruise and no bitter pit. In controlled atmosphere storage, apples should be as good or perhaps better than those for cold storage. The bitter pit problem does seem to be minimized by controlled atmosphere storage.

We use certain guide lines for proper storage of apples. Varieties should be stored separately, apples should be stored by condition, and a complete record of size distribution, maturity and intended end use should be kept. Daily input must be kept within the refrigerating capacity. There must be a quick pull-down of temperatures, and a dependable log of temperatures and humidities must be kept.

We have found that the proper storage of apples for processing has a tremendous effect on product yield. You may be interested in how we reached this conclusion. Below are comparative cost figures based on yard, refrigerated and controlled atmosphere storages of orchard run Northern Spys:

Type of Storage	Direct Labor Cost/lb. (labor at 1.53/hr.	Fruit Cost Per lb. (Raw Product at 3.50/cwt.)	Combined Cost Per lb. Fresh Slices Produced
A. Yard Storage	$.0265	$.0690	$.0955
B. Refrigerated Storage	.0209	.0630	.0839
C. C. A. Storage	.0208	.0570	.0778

Differential between A and B = $1.16 per cwt. fresh slices.
" " B and C = $ .61 " " " " .
" " A and C = $1.77 " " " " .

From these comparisons, you can readily see that applying commercial rates for cold storage and controlled atmosphere storage, the fruit costs per pound of fresh slices produced are reduced enough to offset storage costs. In addition, there are substantial savings in direct labor costs per pound of fresh slices produced.

The figures are very rough and based on a relatively small part of our total production. However, they pretty well bear out what we have observed in our operation over several operating seasons. The differences in labor costs and fruit costs per pound of product produced may not be as significant in the production of apple sauce but we feel they may be important enough to warrant further study.

Other Reasons

I would like to add that there are many other reasons than improved product yield for our using both regular and controlled atmosphere storage for apples. In using storage to extend the processing season, it is possible to keep investment in processing equipment at a minimum by utilizing the equipment over a much longer period. Employment and labor problems are minimized by avoiding peaks of extremely high labor requirements. It is much easier to attract high caliber employees and they are much happier. In the case of frozen apple slices, it may be just as economical to store apples in fresh form as it is to store them frozen. Storing in fresh form permits a greater degree of flexibility in producing various types of slices. It is possible to produce a finished slice in quantities to meet a customer's specific product requirements.

In order to produce a quality product for the consumer, a processor must have high quality fruit to start. Putting fruit into a can or glass jar will not make it any better or more wholesome than it was originally. We feel we must pay more attention to the preservation of this high quality through improved handling methods. Better storage will play a very important part.

2. INFLUENCE OF VARIETIES ON PRODUCT QUALITY AND COST

a. GENERAL CONSIDERATIONS

R. L. LaBELLE
Associate Professor of Food Science
New York State Agricultural Experiment Station
Cornell University
(Geneva, N.Y.)

To many not directly engaged in its utilization, no doubt, an apple is an apple. But at the same time, it is hard to think of a fruit or vegetable in which varietal differences are so wide and varied. These differences are masked to some extent in the final product as the consumer sees it because of blending or formulating. But the processor is very much aware of the factors which influence the yield and quality of his product and to some extent pays a premium for the apple which best fits his requirements.

It is easy to see that color, flavor, and firmness of the fresh apple will directly influence these same primary factors in the processed product. But there are many others which affect yield and quality as well. The most important influences are listed below in the order in which they occur:

(1) At harvest:

harvest date
skin strength
stem length and stiffness
density

(2) In Storage:

rate or ripening
rate of desiccation
storage disorders

(3) During Processing:

size
shape
seed pocket size
rate of darkening
permeability (to SO_2)
resistance to thermal softening
juice-holding capacity

(4) In Product:

firmness
flesh color
sugar content (solids)
acidity

While harvest date may contribute other management problems, the principal one to affect the product directly may be the average temperature at harvest and its effect in turn on ripening in common storage. In general, the earlier the harvest the less leeway there is in storage time. Skin strength and stem characteristics will become increasingly important to yield and the "absence of defects" factor in the product grade as mechanical harvesting comes into the picture, for cuts and punctures will be the most serious form of damage encountered there. Density may be of greatest importance in pricing, but it can also affect the requirement for packing a certain weight in a given container.

In storage, we are most concerned with the rates of ripening and desiccation and with storage disorders, all of which can seriously affect the weight of fresh product finally available for processing. Processors place a premium on apples which store well, thereby extending the processing season, minimizing losses of yield and affording most uniform quality.

As the apples enter the processing line their size and shape become important in the peelers where moderately large, symmetrical, and fairly spherical fruit are handled with least loss. Apples under 2-1/2" in diameter may yield less than 50% of their weight in slices -- hardly a paying proposition. Varieties with markedly oblate or conical fruit also give reduced yields and less desirable slice shape. The extensive seed pockets found in some varieties require large seed-celling cuts and an additional percent or two of loss as chips.

The rate of darkening of the apple flesh, particularly near the core and in the fibrovascular bundles, may be troublesome if there are built-in delays in the processing line or if mild, relatively slow-acting preservative

methods are required in order to retain firm texture. Permeability to SO_2 varies with both variety and ripeness and may determine processing conditions. Some varieties soften much more than others when subjected to a thermal process, and this factor alone may effect a dividing line between good and poor processing varieties. And unless one is making juice during processing; this factor is highly variable among varieties and is also one of the chief differences between good and poor processing apples.

Finally, the finished product quality is dependent on the original firmness, flesh color, solids content, and acidity of the fresh apple as modified by storage ripening and processing. It is almost impossible to generalize here as different markets demand different product characteristics. Perhaps the most universal requirement would be the integrity, or texture, of the apple slice, though they can also come out too hard or tough.

In the final analysis, each processor must be aware of the needs of his customer and of the relationship between cause and effect throughout harvest, storage, and processing. Then, with a knowledge of the usual characteristics of a variety over the years and a sharp eye for the seasonal effect, he can select the apples he needs or modify the aforementioned causes to obtain the desired effects. It is perhaps in providing information on this cause-and-effect relationship that the food technologist can be of most help to him -- in effect, providing new harvest, storage, and processing techniques to meet changing needs.

b. RESULTS OF LABORATORY TESTS

CHARLES WOOD
Associate Professor of Food Technology
Virginia Polytechnic Institute
(Blacksburg)

The purpose of our work in Virginia is to determine the effect that varying quantities of Red Delicious of differing degrees of ripeness have upon the quality of apple sauce. Recent apple tree surveys indicate that Red Delicious plantings are replacing the more desirable processing varieties.

The number of Red Delicious being planted is large enough to cause the concern in apple processing industry circles that in a few years the supply of this variety will exceed the demand. While controlled atmosphere storage will extend the marketing season and make possible a more orderly marketing of some of this increase, the industry will be faced with harvesting and handling of about 60% of the total apple crop within a period of two weeks. With labor being in short supply and the difficulties being encountered in producing a suitable mechanical harvester, there is a strong possibility that many Red Delicious apples will be too soft to be marketed fresh. With the increasing supplies of Red Delicious and decreasing supplies of desirable processing varieties, such as York, what alternatives does the apple processing industry have but to use increasingly larger quantities of Red Delicious for manufacturing its product?

In this study we have attempted to determine the effect, if any, of incorporation of Red Delicious in varying amounts and maturities on the quality of apple sauce blends.

Three stages of ripeness of the Red Delicious apples were used in this study: hard, firm-ripe, and over-ripe. Each of these stages of ripeness was used in four different blends containing the Red Delicious and two other varieties. The other varieties in Blend A consisted of Grimes and Jonathans, in Blend B -- Golden Delicious and Yorks, in Blend C -- Romes and Yorks, and in Blend D -- Staymans and Yorks. The ratios of Red Delicious to the other two varieties in each blend varied from 20 to 60% with 10% intervals. The varieties other than Red Delicious were always blended in equal quantity and were in the ripe stage of ripeness. Ripeness was determined by the Magness-Taylor Pressure Tester fitted with a Mechanical Thumb. Firmness readings were found to be a poor indication of maturity. A different method will be used next year in determining maturity.

Consistency. No definite trends were noticed in consistency as determined on the Adams Consistometer. Results this year indicate that incorporation of Red Delicious apples into sauce had no apparent effect upon the sauce consistency.

Total Titratable Acids and pH. Total titratable acids, reported as malic, and pH were definitely affected by both the degree of ripeness and the ratio of Red Delicious to other varieties in all blends. Blends having the largest quantities of over-ripe Red Delicious apples registered the highest pH and the lowest total acids. Blend B -- Golden Delicious, Yorks, and Red Delicious -- had the highest pH, 4.07.

Soluble Solids. While soluble solids were controlled rather carefully throughout the entire pack, a noticeable increase in soluble solids was found in those samples having the largest quantity of Red Delicious.

Color. Color was measured with a Hunter Color Difference Meter. A difference in L values was noticed among blends. The blend with Grimes and Jonathans had the highest L value, 54.3; followed by Golden Delicious-York blend with 53.4; while the Rome-York blend had the lowest, 51.7. No noticeable trend was established by varying the ratio of Red Delicious with other varieties. Degree of ripeness had a greater effect upon the Hunter minus a_L value, than did variety blends. As would be expected, the hard Red Delicious had a higher mean Hunter minus a_L value, indicating more greenness, which was -4.8, than did the over-ripe which was a_L -3.4. No definite trend was established by varying the ratio of Red Delicious to the other varieties. The plus b_L value increased, indicating more yellowness, as firmness of Red Delicious decreased. Blends containing Golden Delicious and Yorks had the highest $+b_L$ value, 18.6, while the blend containing Romes and Yorks gave the lowest $+b_L$ value, 17.4. Again no noticeable trend was established by varying the ratios of Red Delicious to the other varieties. The degree of ripeness and varieties in the blend had a greater effect upon the color than varying the ratio of Red Delicious to other varieties in the sauce blend.

The organoleptic evaluation of this pack of apple sauce was performed by a panel of 15 participants.

Natural Apple Flavor. The firm-ripe stage of Red Delicious received the highest mean score for natural flavor while the over-ripe rated the lowest. Varying the per cent of Red Delicious had no effect except in the over-ripe stage. As the ratio of over-ripe Red Delicious increased the mean score for flavor decreased.

Tartness decreased as the per cent of Red Delicious increased in the sauce blends. The degree of ripeness of Red Delicious had little effect upon tartness. Varieties of apples in the blends had more affect on tartness than did ripeness. Blends containing Golden Delicious and Yorks scored the lowest, while blends containing Grimes and Jonathans scored the highest for tartness.

Texture. Increasing the ratio of Red Delicious to the other varieties tended to increase the graininess of the sauce. Blends containing Golden Delicious and Yorks scored higher on graininess than those containing Grimes and Jonathans which scored lowest.

Sweetness. Varying the ratio of Red Delicious had a noticeable effect upon sweetness. The higher the per cent of Red Delicious in blends, then higher was the score for sweetness. As would be expected, the over-ripe Red Delicious apples in the sauce blend received the highest score for sweetness.

General Acceptability. Blends containing firm-ripe Red Delicious received the highest score for general acceptability. Golden Delicious-York blends received the lowest score, while the blend with Grimes and Jonathans received the highest general acceptability score. Sauce blends containing less than 50% Red Delicious were more generally acceptable than blends containing 50 or 60% Red Delicious apples.

In conclusion, the results of this study showed that the stage of ripeness of Red Delicious apples and the ratio to other varieties in which they are used in blends do effect pH, total titratable acids, color, flavor, tartness, and general acceptability.

C. W. HITZ And F. T. McARDLE*
Department of Horticulture
Pennsylvania State University
(State College, Pennsylvania)

Pennsylvania State University is in the middle of a three-year regional study of apple varieties for processing (NEM-27). The two major objectives are:

Messrs. Hitz and McArdle were out of the country at the time of the Conference. This paper was prepared by Dana Dalrymple from materials which they supplied.

- to determine the characteristics that the apple varieties important in Pennsylvania can contribute to processed sauce

- to determine the best means of maintaining these characteristics during handling and processing.

The work was started during the 1964 harvest season and will be completed sometime following the 1966 harvest period. Three phases are, therefore, involved.

I. During the first phase (1964 harvest period), it was found that taste panel members preferred commercially prepared sauces above the Red Delicious sauce prepared from the apples of any of the experimental samples of the experiment.

II. During the second phase (1965 harvest season), an effort was made to determine how to improve the acceptability of sauces made primarily from Red Delicious apples. This involved identifying the characteristics that each of several varieties - Red Delicious, Golden Delicious, Rome Beauty and Stayman Winesap -- contribute to sauce. Sauces from these varieties, processed at harvest and after storage, is to be evaluated for (a) color, (b) consistency and body, (c) flavor components, (d) acidity, and (e) taste panel acceptability. It is anticipated that these tests will help determine which variety or varieties might compensate most for weaknesses in Red Delicious as a sauce variety. Evaluation of this work has not been completed.

III. The third phase will start during the fall of 1966 and will be directed at: (a) confirmation of the identification of the characteristics different apple varieties are able to contribute to sauces and sauce blends; and (b) determining the best methods of maintaining and utilizing these characteristics with sauce made from Red Delicious.

While it will be some time before the project is completed and reported, it should be well worth watching for by those with an interest in the varietal question.

E. ZUBECKIS
Horticultural Products Laboratory
Horticultural Experiment Station
(Vineland Station, Ontario, Canada)

Good dessert apple varieties, like McIntosh, Northern Spy, Red Delicious, Golden Delicious, Cortland, Jonathan and others are grown in commercial quantities in Canada, but apple varieties for processing are available in limited amounts. The apple processing industry has to depend mainly on dessert varieties or varieties less desirable for the fresh market. Canadian apple breeders are involved in the testing of available varieties, and are trying to develop new varieties suited to the local climate and the needs. Research laboratories, associated with horticulture, help to evaluate and screen apple varieties for the fresh market and for processing.

Background Statistics

Approximately 450,000 tons of apples were produced in Canada in 1964. Commercial apple production is confined to rather limited areas in Ontario (33%), British Columbia (34%), Quebec (19%), Nova Scotia (12%), and New Brunswick (2%). Production of McIntosh represents more than a third of output in all provinces except Nova Scotia. Northern Spy is important in Ontario, and Delicious in British Columbia.

The apple crop was utilized as follows in 1964: fresh, 41%; exported, 15%; and processed, 34%. About 64% of the processed apples, or 21% of the total crop, was made as juice. The breakdown for all apple products is indicated below:

Juice and concentrate	64%
Sauce	10
Canned slices	10
Pie fill	6
Frozen slices	3
Pulp	1
Vinegar (SO_2)	1
Others (dehydrated apples 0.3%)	5
Total	100%

These figures show the significance of juice for the Canadian apple industry, and also explain the special interest payed to this product in research.

Apple Juice

Apple juice is made mainly from second grade and cull apples. The apples are not stored at the plants, but processed on delivery,and the quality of juice varies from lot to lot. Annual production is about 12 million imperial gallons (compared to 19 million gallons of tomato juice and 0.6 million gallons of grape juice).

The chemical composition of Canadian apples has been investigated for several years and a considerable fluctuation in the same variety from different growing areas, and from year to year has been found. Commercially important Ontario apples, evaluated as juice, have been classified as follows:

Very good:	Northern Spy, McIntosh, Baldwin
Good:	Red Delicious, 20th Century
Fair:	Cortland, R.I. Greening, Wolf River
Poor:	Sandow, Monroe, Tolman Sweet, Sturmer

Some apple processing specialist suggest that a good apple juice can be obtained only from a mixed variety of apples. We were able to make an excellent apple juice from single varieties, like Northern Spy, McIntosh, Baldwin, Red Delicious and others, and to preserve the characteristics, aroma and flavor of these juices at least for one year at $0^{o}C$. I feel that we are very far from a definition of a good apple juice because the

appraisal is purely subjective. But in our opinion, a good apple juice should remain as close as possible to the fresh apple in aroma and flavor, it must have an eye appealing color, and a balanced sugar: acid ratio.

The work on juices has been focused in our laboratory on three principal apple varieties: McIntosh, Northern Spy, and Red Delicious. The juice obtained from these varieties can be described as follows:

McIntosh:	Very good. Mild (low acidity) with a distinctive aroma which gradually weakens during storage (0°C).
Northern Spy:	Very good. Has strong and distinctive aroma and flavor which is well recognizable even after 2 years of storage (0°C).
Red Delicious:	Good. Has low acidity and high sugar content (unbalanced sugar: acid ratio). The distinctive aroma and flavor is inclined to change during storage.

The chemical composition and quality of Canadian commercial apple juices has been investigated in our laboratory since 1957.

Continuing Testing

Two hundred and forty apple varieties (22 seedlings included) are grown at the Horticultural Experiment Station at Vineland, and 120 of these are being tested in the Horticultural Products Laboratory this season. The apples were stored at 0-2°C and high humidity. The storage life is determined. Varieties from which highly rated sauce and baked apples at intervals as long as any apples are left. Each variety is tested for at least three years.

McIntosh is rated only fair as a cooking apple. It is a problem apple because of its tendency to break down during processing. The head of our laboratory, Dr. Truscott, has spent a considerable amount of time in the development of a good McIntosh pie fill. A highly acceptable McIntosh pie fill can now be made when the air is evacuated from the slices immersed in a sugar syrup.

Commercially important apple varieties are tested in our laboratory also for hard cider. Hard cider (fermented apple juice) has been produced in Canada commercially for many years by the farm industry, and in Nova Scotia by some apple processors. Production of carbonated cider was started in British Columbia several years ago, and there is a growing interest in these products in Ontario also.

Several apple products have been improved or developed in our laboratory. I would like to mention the pie fill, frozen apple slices, frozen baked apples, and the apple juices, concentrates and carbonated beverages.

c. PROCESSOR EXPERIENCE

JAMES R. OYLER
Director of Manufacturing
Knouse Foods
(Peach Glen, Pa.)

The subject of this conference, "Processing an Expanding Crop," has invited all of us to meet a challenge. As a representative of a fruit processor, I can make some contribution to this reservoir of knowledge by citing my experience in processing fresh market or dessert type apples. Foremost in this classification is the Red Delicious variety. In this discussion, I must limit my comments to observations made in our own organization -- Knouse Foods.

General Considerations

Paramount in the processing of any apple variety is well matured, sound fruit. While this may sound prosaic, it is non-the-less important. And, the further removed the apples are from this utopia, the more the processing difficulties are compounded. How do we get and keep "well matured, sound fruit"? What are the factors involved? Listing some of them and not necessarily in order of importance, they are:

1. Horticultural practices and climate
2. Maturity at time of harvest
3. Care in harvesting
4. Handling at time of harvest
5. Storing prior to processing
6. Time of processing
7. The final processed product

Although some of these points at first seem far removed from processing after I discuss them briefly, you will agree there is a connection.

Horticultural practices involve the actual production of the fruit. Here we encounter pruning, fertilizing and thinning because these influence size, firmness, flavor and sugar content of the apples. Climatic conditions such as temperature, sunshine and rainfall affect the processing characteristics, yields and quality.

Maturity at harvest time is very important because here we find great influence not only on keeping quality, which affecting processing production costs, but the acceptability of the end product. If the apples are immature or over mature, the effect is observed all along the line from beginning to end.

Care in harvesting shows up in processing yields, costs and quality of product. Specifically, bruising can be controlled by careful harvesting and if uncontrolled is evidenced at every stage in the processing channel

Closely associated with the point just mentioned is handling at the time of harvest. Importance is attached to the prevention of lengthy exposure to direct sunlight, to elevated temperature, to careful handling and to prompt removal of orchard heat. These factors have much to do with favorable processing conditions.

We come to storing prior to processing and here I mean cold storing because dessert apples can be held satisfactorily in no other way. The peak of maturity for processing in dessert apples is short and to prevent deterioration, proper storage is imperative. The use of controlled atmosphere for apples for processing is near and must be considered seriously. The extension of peak processing by CA storage holds other advantages. One of the important advantages is the alleviation of a serious labor problem resulting from seasonal employment of cannery workers. With the problem of acquiring sufficient help on a temporary basis becoming more acute, the lengthening of the processing season has advantages in acquiring and holding a desirable class of workers.

The time of processing, that is, how long after harvest time the fruit is stored before processing, must be a primary concern of the processing industry. Even if the apples are held at 32° storage, the finished products will eventually show the effects of long storage. Flavor loss, decrease in acid, loss of firmness and lower yields are in evidence. How the apples hold in storage not only is influenced by time but conditions at the time of storing and the effectiveness of the refrigeration system.

The final processed product, the end use of the fruit, is of prime importance. Whether it is used in juice, concentrate, vinegar, apple butter, sauce, slices or one of the exotic new products makes a difference. The degree of maturity of apples for butter is not as critical as for sauce. In the latter product, they are peeled and cored, their color and flavor are more critical and quality characteristics of the finished product are more readily influenced by maturity. Obviously, the fruit that can be advantageously used in apple sauce, for example, is worth more than that used in vinegar and this difference is influenced by one or more of the seven points outlined above.

Red Delicious

Amplification of processing experience of Red Delicious is in order at this point of our discussion. This variety has been used in processing and will continue to be introduced in ever increasing quantities. To accomplish this advantageously two facts must be remembered:

1. Red Delicious are comparatively low in natural acidity, and
2. The character of this variety results in smoother finish or texture and lighter consistency in some processed apple products such as sauce.

These qualities of Delicious can be balanced out by using this variety in products where these characteristics are an advantage or at least not a disadvantage and by observing the seven factors mentioned earlier. Further, the incorporation of Vitamin C bolsters the acidity the contributes nutritional benefits. Citric or malic acid used as an additive assists in compensating for lower acidity. Blending of Red Delicious with those varieties where the lower acidity and smoother texture compliment each other is a recognized possibility.

Summary

The processor experience in using fresh market varieties can be summarized in a few brief statements. Yes, dessert apples can be used in processing if they are carefully harvested, properly stored and are used in the right way. To attain these conditions, we may be required to improve our practices, develop new products and, in general, change our thinking. These changes must come.

The vitality and vigor of an individual, of an organization, even of a civilization can be measured by its adaptability, by the ease with which it can meet changing conditions. I envision the apple processing industry as vigorous, adaptable, and vital and I'm sure you share my enthusiasm and confidence for the future in using fresh market apples in processing.

3. INFLUENCE OF GRADING AND SAMPLING METHODS ON FINISHED PRODUCT QUALITY AND COST

a. EVALUATING RAW PRODUCT QUALITY BY USE OF COUNT PER HUNDRED AND TRIM WASTE*

DANIEL F. FARKAS
Assistant Professor of Food Science
New York State Agricultural Experiment Station
Cornell University
(Geneva)

Research carried out over a ten-year period by workers at the Virginia Polytechnic Institute (VPI) indicates that the procurement of apples for processing, on the basis of count per hundred weight and per cent trimmable waste, would result in more efficient utilization of apples for processing.

The method outlined by the Virginia workers requires sampling of a load of apples at random from eight locations. A sample size of about 25 pounds of apples from each location is used. The size of the apples in the load is determined by counting the apples in the sample and dividing by the weight of the sample.

The original sample may be subsampled at random to obtain about 100 apples for trim waste determination. Apples are sized and carefully peeled and cored on commercial equipment set to remove a minimum of peel. Next, the apples are hand trimmed to remove discolored or defective tissue according to good practice. The trim waste is weighed and calculated as a per cent of fresh apple weight corrected for culls and undersized apples.

The processing quality index consists of the count per hundred weight and per cent trim waste. The Virginia workers were able to devise methods for computing processing value for a load of apples; results of this work are available in bulletin form from VPI.[1/]

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* A more complete report on this work is expected to be published in the near future.

1/ J. M. Johnson, Anthony Lopez, and C. B. Wood, Equitable Pricing of Apples for Processing, Virginia Polytechnic Institute, Agricultural Experiment Station, Bulletin 559, June 1965, 35 pp.

The VPI grading method was tested in three New York State apple processing plants. This work was carried out as a cooperative study between processors, the New York State Department of Agriculture and Markets, the Federal-State Raw Products Inspection Service, and Cornell University. The 500 loads used in this study, over a 20-day period, were inspected conventionally for comparison and varieties included were Rhode Island Greenings, Northern Spy, Baldwin, Cortland, Rome, and 20 oz.

Methods used in this study were similar to those recommended by the VPI workers, except that 50 apples were taken from the eight exposed pallet boxes on the top of each truck load. Count per hundred weight was determined on the 400 apples, and a random 100-apple subsample was used for trim waste measurement. Usable material was calculated as the per cent of peeled, trimmed, and cored sound fruit resulting from the 100-apple subsample.

Sampling proved to be the largest problem. Variations between conventional grading results and those of the new method were large on a load-by-load basis. Agreement was slightly improved when loads from the same grower were averaged. Improved sampling methods are a prerequisite to any improvement in raw product quality control of apples.

To compare the size of apples measured as per cent 2-1/4", 2-1/2", and 2-3/4" and up with count per hundred weight, the diameter mixture was plotted on triangular coordinate graph paper, and the resultant point assigned the count per hundred weight figure. The points fell on a band which extended from 0% 2-3/4", equivalent to roughly 500 count per hundred weight, up to 100% 2-3/4", equivalent to 250 count per hundred weight.

Trim waste was found to be below 5% for all locations and, in many cases, was below 1%. Usable material was a function of apple size but varied far more with peeling machine setting.

In summary, count per hundred weight and per cent trim waste are excellent quality control measurements for apple processors interested in improving raw product quality and plant efficiency. The major problem encountered in the application of the VPI grading methods inplant was adequate sampling.

b. SAMPLING BULK-BIN LOADS

JOSEPH JOHNSON
Professor of Agricultural Economics
Virginia Polytechnic Institute
(Blacksburg)

Wednesday, several growers deplored the lack of uniform inspection results on the same apples. At that time I suggested that the cause of variability in inspection might be due more to sampling methods than to variation in inspection.

Are you really interested in knowing the size of apples and level of defects in a given load? Having asked the question, I will give you my opinion as to what your answer should be. I think you should be interested, now, and I think that in years to come you must know if you are to stay in the processing business.

With the increase in storage of apples for processing and the adoption of mechanical harvesters, leading to greater variability in bruising damage than is now existing, the size and quality attributes to each load will have to be known to decide what disposal will be made of it as well as to serve as a basis of pricing.

A processor is interested in maintaining as even a flow of finished product through his plant as is possible to have efficient production. Size of apples and level of defects will pretty well determine the volume processed in a given time period. The storage of loads should be such that he can balance size, defect level, proper varieties, and ripeness as nearly as possible. Probably a pressure test should be added to inspection report.

A study made last fall is pertinent to this problem. We compared three methods of sampling bulk-bin loads. The methods were:

1. Corner sampling
2. Blackwelder inversion sampling
3. Port sampling

The first two methods are now in use in processing plants represented here at the conference. The Blackwelder inversion method is also representative of two other methods either now in use or in use in the past: immersion and stove pipe sampling. The port method is new (it was suggested in an earlier study but not actually tried on a commercial scale).

Twenty-three loads were sampled by each of the methods. With corner sampling, a bushel of apples were selected as near as possible at random from the top and corners of each of three bins per load. The bins to be sampled were selected at random from the load. We attempted to draw some of the apples from beneath the surface but were unable to reach any below one foot from the surface. The sampling took about 20 minutes per three bins and required attendance by a fork-lift tractor for approximately half of the time.

Three bins were also sampled by the Blackwelder inversion method. The sampling took about 20 minutes for three bins and required a fork-lift in attendance at all times. The sample itself was a vertical cross section through one of four possible positions in the bin. About one bushel was collected per sample.

The port method required the provision of sampling ports or doors in the bottom of the end panel of each bin. Although not entirely necessary, we provided a port in each end so that no care had to be taken in loading to insure that the port was exposed on each bin in the load. The sample was drawn by opening the port and allowing 25 lbs. of apples to run out. Some bridging occurred which was broken by upward pressure on the bridge.

It took from one to two minutes to sample a bin depending on the amount of bridging that occurred. Eight bins were sampled per load in less time than it took to sample three bins in the other two ways. No fork-lift was needed in attendance.

Each bin sample by each method was run over a chain sizer and divided into six classes. The entire load was then run over the same sizer. The distribution of apples in the samples drawn by the different methods were correlated with the distribution in the loads.

To state it briefly, the variations in the different size classes in the load were 68% explained by the corner samples, 66% explained by the Blackwelder samples, and 90% explained by the port samples. The variation in the value of the 23 loads was 75% explained by the first two methods and 95% explained by the port samples. There is no question but that the post samples are superior to the other two methods.

Each bin in the study was handled 45 times with a fork-lift in sampling the 23 loads. Two ports were lost because of a fork being struck through them. At the same time three other bins were lost by non port-related causes. So, the ports will stand up to commercial treatment quite well.

Cost-wise, the corner sampling method is cheapest, estimated to be $1.08 per load when sampling three boxes. The Blackwelder was highest at $1.89 for three boxes. The port method was estimated to cost $1.35 per load for eight bins samples.

The problem can be licked at little additional cost if we want to take the trouble to do it.

4. INFLUENCE OF PROCESSING METHODS ON FINISHED PRODUCT QUALITY AND COST

a. WAX SOLVENTS AND LYE-PEELING OF APPLES

W. O. HARRINGTON
Fruit Investigations, Plant Products Laboratory
Eastern Utilization Research and Development Division, USDA
(Philadelphia, Pa.)

The present mechanical method of peeling apples in the manufacture of sauce or slices has several serious disadvantages. It requires a great deal of labor to position each apple on the machine and to trim the fruit afterwards. The loss of raw material, as peels and cores, is excessive. It may vary from 22% for 3 inch apples to nearly 50% for 2-1/4" inch apples.

Lye-peeling of apples, combined with core removal in a finisher, offers several potential savings in sauce manufacture: (1) a reduction of labor cost, (2) an increase in yield of product of about 20%, and (3) a potential reduction in cost of raw material by using smaller sizes of

fruit. Since size of fruit is not critical in lye-peeling, it would be possible to use apples under 2-1/4 inches diameter. Such fruit is too small to peel mechanically and could be purchased for about one-half the price of present sauce grades of apples.

Lye-peeling is used commercially on many fruits and vegetables. The heavy wax coating on apples presents a special problem by interfering with lye penetration. Without wax removal, the time and temperature required to lye-peel apples is so great that it causes excessive softening of the tissue under the peel. We have resolved this difficulty by using wax solvents prior to, or combined with, the lye treatment. This is a progress report on the present status of this work.

The procedure that we have used for lye-peeling is the following. The apples are dipped in hot (150 to 170°F.) iso-propyl alcohol for 30 to 60 seconds. This removes most of the wax. Ethyl alcohol is equally effective but involves serious tax problems, bonding, inspection, etc. Iso-propyl alcohol can be used either as a hot dip or as a vapor. It can be used over and over for 30 to 50 volumes of fruit before it is necessary to discard, concentrate, or redistill the alcohol.

Following dewaxing, the apples are immersed in 15 to 30% alkali at 140 to 180°F. for two to four minutes. The softened peel must be removed immediately since it toughens on cooling and standing. A combination of abrasion and high pressure water sprays will remove most of the peel. An acid dip following lye-peeling aids in preventing fruit discoloration.

Although the apples may be free of peel, they still have a woody stem, inner calyx fibers, seeds, and carpel tissue which must be removed by the finisher. Apple sauce made from non-cored, lye-peeled apples compared favorably in texture, color, and flavor with commercial apple sauce from mechanically peeled and cored apples. It did contain more seed coat, calyx, and peel fragments. The use of a smaller mesh finisher screen removed some of these defects. However, it altered the sauce texture.

Although some engineering studies are yet to be done, it now appears that the use of wax solvents has improved the lye-peeling of apples sufficiently that it can be used whenever peeled apples are required.

b. OSMOVAC DRYING OF APPLES

FRANK P. BOYLE
Head, Fruit Processing Investigations
Western Utilization Research
and Development Division, USDA
(Albany, Calif.)

Introduction

A technique as old as man's first efforts in preserving food has been brought up to date, embellished a little, and tested as a method for the dehydration of apples and other fruit. The Greeks prepared olives

by immersing them in a salt solution, which drew the water out of the fruit. Since we didn't want our apples to taste salty, dry sugar or a sugar sirup was used to cover the pieces of cut fruit in order to withdraw water from the fruit cells.

"Osmd" is used in the name of the process to represent removal of about 70% of the water in the fruit by osmosis; "vac" represents the second stage in the process in which remaining water is removed in a vacuum shelf dryer.

Osmosis

The membranes surrounding the living cells in a plant tissue are semi-permeable, which means that small molecules (water) can pass through them readily but larger molecules (sugar) pass through slowly or not at all. Thus, in our system with cut pieces of fruit bathed in sirup or dry sugar, the water and other small molecules are drawn out of the fruit into the highly concentrated sugar solution. As dehydration proceeds, the sugar solution becomes more dilute and the solids in the fruit become more concentrated. Eventually the rate of osmosis decreases and the fruit is removed and finished off by other means.

Several steps can be taken to speed up the rate of water removal by osmosis. First, the sugar solution can be kept at a high concentration by removing the diluted sirup and replacing it with fresh, highly concentrated sirup. Second, the mixture can be agitated or stirred which will speed up the diffusion of water out of the fruit. The agitation, however, cannot be too vigorous or else the pieces of fruit will be damaged. A third way to speed up osmotic drying would be to increase the temperature of the solution. Up to about 120°F. there is no damage to flavor and the osmotic process can be shortened from as long as 20-24 hours down to only 2 or 3 hours. Perhaps all three methods could be combined by circulating a warm, high Brix sirup through the fruit.

Final Products

After removing about half of the weight of the fruit by osmosis, it can be drained and frozen, and then handled and used like the dehydrofrozen apple slices developed at WU several years ago.

The second stage of drying can be carried out in a vacuum shelf dryer or by conventional air-drying techniques. The former method leads to better quality end products with 2% or less moisture content. Air-dried material is satisfactory for some uses and would be more economical to produce than the vacuum dried products.

Reuse of Sirup

A by-product which must be taken into consideration is the sirup which is drained from the fruit after the first stage osmotic dehydration. No processor could afford to throw the sirup away unless he were able to recycle and reuse it several times before discard.

Several alternatives are available for use of this sirup. In an integrated canning-dehydration plant the sirup could be used as canning sirup for conventionally heat-processed fruits. It might be necessary to filter

and concentrate the sirup used for osmotic dehydration before it is pumped back into the plant as a canning medium. Another use which we have tested in our Laboratory is for flavoring ice cream or frozen dessert. After use as an agent for withdrawing water from pieces of fruit, the sirup does contain some flavoring materials which impart a nice flavor to ice cream. Which alternative a processor might choose would depend upon his equipment, other operations, and a more detailed study of the cost involved in each of the choices open to him.

Advantages of Osmovac Drying

A number of benefits may be realized when sugar is used as a dehydrating medium for apples or other cut fruits. First, the water can be removed at low temperatures such that there is no heat damage to color and flavor. Second, the sugar acts as an inhibitor to the enzyme systems which bring about browning of many cut fruits. The protection of color by the sugar permits dehydration without sulfur dioxide treatment, which is desirable since the SO_2 sometimes imparts an off-flavor. Also, in many countries the use of sulfur dioxide or bisulfite treatment to preserve color is not permitted.

Next, the forming of a coating of sugar on the outside of the fruit pieces provides a barrier against the loss of volatile flavor constituents. This carries over to the second stage of drying where the volatile materials are held within the fruit instead of being lost through the application of heat or a high vacuum.

Another advantage of this method can result in control of acidity, or to put it another way, the sugar-acid ratio can be increased. Some sugar from the bathing solution will diffuse into the fruit, but even more important, a considerable amount of acid will diffuse out of the fruit into the sirup. If one wanted to control the final acid content of the dried fruit, it could be regulated by dissolving the right quantity of acid (probably citric acid) in the sugar sirup. In this way the movement of acid would take place until it reached equilibrium at a level previously selected as desirable.

Finally, the fully dehydrated apples are less hygroscopic than fruit dried by other methods -- that is, they will pick up less moisture from the surrounding atmosphere. This is important for maintaining good, crisp texture, and would be a consideration in selecting packaging and storage conditions.

End use of Products

After final drying, especially when carried out under vacuum, the pieces of fruit covered with the dried sugar sirup make a very fine tasting confection. Eaten out-of-hand, the crisp, natural colored pieces impart a very agreeable fresh fruit taste. When properly carried out, the two stage dehydration procedure will puff the fruit into a light-weight, honeycombed texture. Snack items can be made from pieces or slices, too; the processor can use his own ingenuity in adding other flavors and should be able to test the market acceptability. These natural-flavored fruits could be coated also with the usual coverings for making a variety of candies.

As components for a wide variety of baked goods, the low moisture content of the vacuum-dried products should be ideal for incorporation into dry mixes. For other end products with higher moisture requirements, either the dehydration could be stopped at the desired level or else the fully dried pieces could be reconstituted to the level required.

Perhaps the most immediate usage for OSMOVAC fruits would be as components in dry breakfast cereals. The several advantages mentioned earlier should each contribute to making this type of dehydrated fruit ideal for such products. In tests at our Laboratory, it has been shown that the fruits are very compatible with dry cereals -- there is little migration of moisture between the fruit and cereal. When covered with milk, the fruit pieces rehydrate well and do not become soggy during the time that it takes to consume a bowl of cereal.

At the Western Regional Laboratory we feel that OSMOVAC dried fruits offer new approaches to high quality, and we hope that some of you processors will find a number of ways in which they may be used in your products.

Reference

Ponting, J. D., G. G. Watters, R. R. Forrey, R. Jackson and W. L. Stanley (1966). "More flavorful dried fruit." Food Processing/Marketing 27(2): 110-111, 114, 122-124.

c. INFLUENCE OF VACCUM TREATMENTS AND BLANCHING TEMPERATURES*

ROBERT C. WILEY
Associate Professor of Horticulture
University of Maryland
(College Park)

Abstract**

I would like to address my comments to the influence of vacuum treatments and blanching temperatures on the quality of canned slices. There is no question vacuums as short as 1-1/2 min. greatly increased firmness of canned slices over those that received no vacuum. Fruit was also more whole and showed less sloughing. Increments over 1-1/2 min. were not especially beneficial from the texture standpoint and at the same time decreased flavor acceptance. However, color increased as vacuum was held for progressively longer time periods. Higher blanch temperatures up to 240°F tended to decrease firmness and wholeness, increase sloughing, have little effect on flavor, and improve color acceptance.

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* A report of work done under contract with the U. S. Department of Agriculture and authorized by the Research and Marketing Act of 1946. The contract is being supervised by the Eastern Utilization Research and Development Division of the Agricultural Research Service.

** Further details of this project will be reported in a forthcoming publication by R. H. Dougherty, Mildred Modery, and R. C. Wiley, "Effect of Vacuum Time and Steam Blanch Temperature on the Quality of Canned Apple Slices."

Drained weight increases were most normal in canned slices which were vacuumized 1-1/2 min. followed by a steam blanch at 212°F for 20 sec. A drained weight increase of about 10% is optimum and should be equally divided between the filling operation and the pick-up from the syrup in the can. As weight increase went over 10%, principally from can syrup, slices became water-logged and soggy.

d. THE MEASUREMENT OF CHARACTER IN CANNED APPLE SLICES*

J. C. MOYER AND M. C. BOURNE
New York State Agricultural Experiment Station
Cornell University
(Geneva)
D. J. CASIMIR
Division of Food Preservation, C.S.I.R.O.
(Ryde, N.S.W., Australia)

The United States Standards for grading canned apple slices are commonly used for evaluating the quality of canned apple slices. The samples are graded by assigning scores according to the following point system:

Factor	Points
Color	20
Uniformity of size	20
Absence of defects	20
Character	40
Total Score =	100

In the course of a study on the canning of apples, the slices were graded according to the U. S. Standards; the most frequent cause of down-grading was lack of Character. Character is defined in the U. S. Standards as "texture of the slices and the tendency to retain their conformation without material softening or disintegration." A condition most frequently found in the down-graded slices was a soft or mushy exterior -- although the interior might be quite firm. Thus, some samples that had a generally firm texture scored low in Character. With 40 points of the total grade score being allotted to Character, a study of the conditions affecting this grade factor seemed highly desirable. In order to do this, an objective measurement of Character was needed to correlate processing variables and product quality.

The canned samples used in this study came from processing studies conducted over a 2-year period using Rhode Island Greening apples. The first season's samples showed a wider range of Character score due to improvements made in processing before the second season. The physical tests were also modified as more information was obtained on the causes of low Character scores.

Physical Tests of Firmness

The firmness of the apple slices was measured in terms of shear and compression forces. The standard Kramer-Lee shear press was used for determining the shear force. The compression forces were measured in an Instron

*A more detailed report of this work will be submitted for publication in a professional journal.

Universal testing machine where the volume of slices approximating that of a No. 2 was compressed in a test cup.

When the results of the physical tests were compared with the Character scores, it became apparent that there was little agreement between them. An inspection of those samples giving good firmness tests but low Character scores, showed that firm centers caused the high shear or compression forces, whereas the exterior of the slices was soft and mushy. Usually the samples that had soft external flesh were severely down-graded and, frequently, were scored Grade C or sub-standard. Thus, it would seem that Character is scored more on the external appearance of the slices. Therefore, a measure of cohesion of the external tissue, would more accurately represent Character as defined in the U. S. Standards.

Sloughed Tissue Measurements

Since low Character scores were associated with very soft external tissue, several tests were employed to measure the amount of this mushy flesh. The principle used in measuring the loose flesh was to wash or abrade it away from the firmer material. The volume of this loose tissue would then be a measure of poor Character in the slices.

Two procedures were used. In one, the slices were mixed with water and by means of a kneading-like movement of the fingers, the loose tissue was removed without breaking the intact slices. The other method involved placing the slices with an equal volume of water in a Mason jar which was placed on a shaking table. The oscillating motion of the water was sufficient to remove the soft exterior flesh. In either test, the slices were separated from the liquid on a wire screen and the water was poured into either a sedimentation cone or a graduated cylinder. After standing for an hour, the volume of the solids was read off the graduated scales on the cone or cylinder.

The volumes of the loose flesh were good indicators of Character. Samples having high Character scores gave low tissue volumes; while those with poor Character scores produced a large deposit in the cone or graduated cylinder.

As means of hastening sedimentation of the solids, which required an hour, a sample of the suspension was placed in a graduated centrifuge tube which was whirled at high speed. The centrifugal action packed the loose solids into the bottom of the centrifuge tube and the volume of the solids was then read off the graduations on the tube. However, these volumes are not as reliable indicators of Character scores as those obtained by gravity sedimentation.

Turbidity of Free Liquid

In carrying out drained weight measurements on the canned samples, it was noted that the drained liquid was very turbid. The turbidity of the drained liquids from a number of samples was measured in a clear plastic background. The last number that could be read through the solution was an indication of the turbidity of the sample. A plot of these turbidity readings against Character scores yielded a curve with the Character scores

of the poorer samples falling on the steeper part of the curve which made it difficult to score the poorer samples. Although this test was rapid, its value appears limited to screening poor samples.

Summary

When the texture of canned apple slices is graded according to the U. S. Standards, the Character scores of the slices appeared to be determined by the external appearance of the slices rather than their firmness. Consequently, slices having a soft mushy exterior and a firm center may give shearing or compression test readings but receive poor Character scores. Therefore, any objective measure of Character must emphasize the quantity of loose tissue on the canned slices. The most satisfactory objective procedure developed for measuring Character was to shake the slices with an equal volume of water using a standard reciprocating motion and measure the volume of the sediment in the wash water after one hour.

III. INDUSTRY-WIDE PROGRAMS

A. INTEGRATION OF FRESH AND PROCESSED MARKETING OPERATIONS

1. THE EXPERIENCE OF B. C. TREE FRUITS AND SUN-RYPE

IAN F. GREENWOOD
General Manager
Sun Rype Products Ltd.
(Kelowna, British Columbia, Canada)

As a brief introduction to the subject of the integration of fresh fruit marketing with that of processing in British Columbia, a brief description of our location, the fruit grown, and the unique marketing scheme will probably be of interest to you.

Area Description

The tree fruits grown in the province of British Columbia are largely in the Okanagan Valley which lies between the Rockies and the Coast range and stretches 100 miles north of the International Border of the 49th parallel. The main volume of fruit is grown on slopes and benches that border the Okanagan Lake. Average elevation is about 1,400 feet.

The climate of our area can be termed as semi-arid with the average moisture about 12 inches -- 25% of which is snowfall. The average temperature is a high of 67° and a low of 26°. Temperatures of below zero do occur in certain years, but it is not an annual occurrence. Irrigation is required, with the average soil demanding about 2½ acre feet per year. Practically all irrigation is by sprinklers.

Whereas apples are the largest crop, pears, cherries, peaches, apricots and prunes are also important. Approximately 35,000 acres are planted to tree fruits and this is farmed by over 3,000 growers.

The current average apple crop ranges from 7-8 million bushels. Thirty-five percent of the present crop is McIntosh, 30% is Red Delicious and 15% is Winesap. The trend of plantings is to Red Delicious, Goldens and Spartans. This last variety is a new one developed by the Dominion Research Station in Summerland, and is a cross between the McIntosh and the Newtown. By 1970 it is projected that the crop of Spartans could reach one million boxes.

In recent years there has been great interest shown in dwarf and semi-dwarf trees and there are already a number of plantings on Malling 7, 9, 2 and 104 root-stock and limited acreages of hedgerows.

Marketing History

Our industry is not a large one in comparison with neighboring Washington State standards, but it has always had most or all of the problems inherent in the production and disposition of perishable crops. From the beginning this industry found itself isolated by distance from major markets and exposed to exploitation by opportunists in the produce business as well as the effects of unwise marketing practices of the individualists among its grower

members. Early in its history, it was forced to seek some measure of economic stability and security which it did by following cooperative concepts.

The first movement in this direction was started in 1908, and during the next thirty years the growers struggled through a series of attempts to design some form of producer-controlled cooperative marketing effort to sell more efficiently and in an orderly manner the various fruit crops for the best prices at the lower costs, but which repeatedly ended in failure. The abortion of these plans was invariably followed by a clearing away of the rubble and a new attempt made to build more wisely on the foundation of the previous failures.

The last rebuilding was accomplished in 1939 when the present system of orderly marketing, or one-desk selling, was implemented. It is a unique concept which has drawn the interest of students in agriculture economics from many parts of the world as it has no exact parallel anywhere else. By the will of the majority, and enabled by Government legislation requested by these growers, all of the fresh fruit grown in central B.C. is sold over one desk by an Agency brought into being by these growers for this purpose. While the greater part of the 10,000 carloads of fruit which this Agency sells annually goes to Western Canada, much of it must find a place on world markets -- and B.C. apples may be purchased in season in 34 countries from Finland to Singapore, and in 38 of the United States in normal years.

Orderly marketing, under effective marketing legislation, and through the medium of the central selling agency, is the cornerstone of the Association's broad, basic policy "to do everything possible to protect and further the interests of the growers in all matters directly connected with the production and marketing of their fruit."

Orderly marketing means simply that all of the commodities produced by all of our members shall move to our markets, both near and far, in an orderly and planned manner to produce the greatest total returns possible under the marketing conditions existing during the period in which the crop must be sold, and that the selling is controlled by one agency and board, with the sales proceeds pooled by commodities. It means that individuals, or groups of individuals, shall not be free to seek their own advantage at the expense of the group as a whole, by moving all their production to the most advantageous markets at the most favourable times. In the soft-fruit crop, it means that all producers share in the costs of advertising and promotion, and in the cost of maintaining service to cannery outlets through short crop years. In the apple crop, which must be marketed over a period of eight or nine months, it means that in addition to sharing the cost of advertising and promotion, all producers share in the cost of cold storage, in the risk of market fluctuations inherent in such a long marketing period, and in the risk of shrinkage from holding for later sale. It means the ability to maintain and expand distribution in distant and offshore markets, and to make firm commitments as to quantities, in negotiations with governments, where currency restrictions are involved.

Markets must be supplied in an orderly fashion without alternate gluts and scarcities. Supplies not able to be immediately sold must be stored in cold-storage plants until they can be disposed of as the markets will absorb them.

To avoid advantages through pure chance to a particular grower's crop, because it is sold and shipped into an area where freight charges are small, or the sale is made earlier in the season when prices may be better, or cold-storage costs at a minimum, crops of all growers are pooled as to variety, grade and size.

While we do agree that orderly marketing and central selling are not synonymous, we do contend that under our conditions, central selling and pooling of the proceeds have given orderly marketing an effectiveness and efficiency that could not otherwise be achieved.

In these circumstances, orderly marketing is not designed to interfere with the law of supply and demand. It is rather an attempt to live with it from season to season on reasonable terms.

The fresh fruit agency which sells the entire crop is known as B. C. Tree Fruits Ltd. It owns its own brokerage firm with offices across Western Canada. It also sells fruit through other brokers in Eastern Canada, the U. S. and offshore.

Packinghouses

In the Vally are a number of packinghouses. Most are cooperative owned by grower members in the immediate area, while a few are privately owned. Fruit received from the grower members is cold stored and subsequently sorted, graded and packed. It is shipped to market as orders are received from the sales agency. The packinghouses supply such services as financing, field-service, orchard bins, in addition to the actual storage and packing of the growers' fruit.

Processing

During the late thirties and early forties, attempts were made on a very limited scale to utilize a portion of the cull fruit not salable on the fresh market. Most of these attempts were in conjunction with packinghouses, and products included apple juice, dehydrated apples, and cider vinegar.

By 1945, four by-products operations were underway in various locations in the Valley. This was creating a problem of increasing magnitude for the industry in the growing resentment of growers -- having no interest in processing plants -- that profits from their apples were being accrued by other groups of growers.

As mentioned earlier, the fundamental concept of orderly marketing accepted responsibility to assure all growers access to all markets, or compensation in lieu thereof. While this applied initially to commercial grades, the values being earned for culls were placing them in the same category. There was a growing feeling that only through industry ownership could opportunities in the by-products field be fully developed to the benefit of all growers.

Formation of B.C. Fruit Processors Ltd.

In 1945 a committee was formed to investigate a grower processing company, and a year later the entire grower body approved the formation of such a company to be known as B.C. Fruit Processors Ltd. This name has subsequently been changed to Sun-Rype Products Ltd., thus incorporating our brand name with the title, and the Company acquired the existing plants.

The future of the Company, as with most ambitious business ventures, depended heavily upon the soundness of its fiscal planning, its operating policies and the competency of management. Its ultimate development depended upon the vision, foresight, courage and sound judgment of those responsible for formulating these policies.

The packinghouses were to provide such services as boxes (today this has changed to bulk bins), cold storage and accounting to the grower. Sun-Rype with its fleet of trucks was to pick up the fruit at the 40-odd packinghouses, deliver to its processing plants and return all net proceeds to the grower through his packinghouse, after processing and selling the products.

Early in our history the main products were dehydrated apples, cider vinegar and clear apple juice. The initial plants purchased were old and equipped with mostly shop built equipment. In 1948 the Company acquired a modern plant built two years earlier to produce an apple juice using a similar process to that of pineapple juice extraction. The late J. D. Dole had been one of the founders of the Company. This modern plant is now one of the two owned by the Company, and is the location of our head office. After numerous additions, the plant covers 120,000 sq. ft. Our other plant is located about 75 miles south, and engineers are presently preparing plans for a new plant in that location for next season.

In the late forties, with the assistance of the Federal Fruit and Vegetable By-Products Laboratory at the Research Station at Summerland -- located in the Valley -- a cloudy or opalescent apple juice was successfully developed and now accounts for a substantial portion of our sales of juice.

Returns for the fruit processed in the first years were not high -- the average for the first five years was about $10/ton, and there were many doubters amongst the growers. This doubt actually continued for the first ten years.

It was soon apparent that the value of this processing company was far more than just a salvage operation -- it was actually a balance wheel in the marketing of the apple crops. Large tonnages of Cee grade diverted from the normal fresh market to processing obviously enhanced the value of the fresh fruit returns.

In the early fifties the growers of soft fruits -- peaches, apricots and cherries -- were concerned at possible surpluses and requested that the processing company develop products and markets to handle this fruit. Subsequently, nectars and pie fillings have been developed. This programme has encouraged the planting of sour cherries which had previously not been grown on a commercial scale.

Commercial Canners

During the development of the grower owned processing company, there were a number of established and privately owned canning companies operating in the Valley. Most of them were canning vegetables or fruit purchased from the sales agency. Wherever possible, we have attempted to develop and market products not being packed by the commercial canners. It has been felt that direct competition with these companies would not assist in increased consumption of fruit or in any substantial higher return than the canner is now paying. About the only product where there is any conflict of effort is apple sauce, and our marketing efforts have far surpassed theirs, resulting in a far higher volume of sale.

If it is apparent in the future that the canners are diminishing their efforts to utilize the fruit, it may necessitate the grower owned company entering the canned fruit business. At present, we have been able to work together harmoniously.

Review of First Twenty Years

Now that we have been in existence for twenty years, it may be interesting to you to review a number of factors and, for simplicity, we will itemize them. During the twenty years, some 500,000 tons of fruit have been processed with an F.O.B. sales value of some 55 million dollars.

1. Board of Directors. Since the inception of B.C. Tree Fruits Ltd. and Sun-Rype Products Ltd., each company has had a separate Board of Directors of ten. Each member is a registered grower and is elected annually.

With processing becoming a very important phase of the marketing of the crop, close liaison between the two companies is essential. Earlier this year a decision was made to elect the same members to serve on both Boards, and undoubtedly the next move will be to have one Board of Directors for both companies. In practice, that is what we have today.

2. Plant and Facilities. The trend has been to consolidate our operations into fewer and larger operations. Five plants have been consolidated into two and we are now seriously considering rebuilding the second one as a bulk pressing operation with the juice being tank trucked to the main plant for canning.

Following the trend of others in the industry, lines have been automated and machine speeds increased. Each of the two juice lines at the main plant process 10,000 cases 12/46 oz. on a double 8-hour shift. In addition, our peeling operation handles another 75 to 100 tons per day. Our present planning is for approximately 600 tons of fruit per day -- the equivalent of over one 25-bushel bin per minute for twenty hours.

3. Transportation. Units for hauling have been increasing in size from flat decks to semi-trailers hauling 19 tons per load, or 42 bins. Operation of this equipment during the season has expanded from one shift to two shifts, and this year on three shifts for the first time. In other words, the trend is to fewer, heavier trucks working around the clock.

Transport of juice by tank truck rather than hauling of fruit has proven successful, and this year over one-third of a million imperial gallons were hauled for distances ranging from 75 miles to 300 miles.

4. Products. Over the years these have been expanded from dried apples and clear juice to seventeen in all. We have concentrated on products returning more to the grower for his fruit and have attempted to eliminate the poorer earning products.

To date we have concentrated our marketing to Western Canada -- a population of only six million people. We believe we have been able to increase the per capita consumption of apple juice in this market to the highest in the world, with the one exception of Switzerland. Consistently top quality, a variety of apple juices and a continuing marketing programme are undoubtedly the main reasons for this.

We envy you in your per capita consumption of apple sauce and still have a way to catch up. On the other hand, consumption of fresh apples is higher in our markets, and this may have an effect on sales of sauce. We believe education of the consumer undoubtedly affects consumption of such products as sauce and we have a part-time home economist visiting institutions at present.

To date we have not entered the field of some of the more sophisticated forms of dehydrated apples. Apple rings are only packed in years of surplus.

5. Varieties. Increasing plantings of Red Delicious are causing some concern as to utilization of the Cee grade and culls in processing. Minimum acid requirements by government grades restrict the quantity of Delicious we can use in our juice blend. McIntosh, Winesap and the other sundry varieties present no real problem. For peelers we use Rome Beauty, Jonathan, Goldens, Spartans and McIntosh.

6. Returns to the Growers. Up until three years ago, the payment for culls and Cee grade was pooled separately. With larger percentages of Cee grade being diverted to processing, the industry decided to combine the two into one pool known as Process grade. The returns from the fresh fruit sales of Cee grade are added to those of ours.

Last year we processed 35,000 tons -- approximately 30% of the crop. This was the second largest tonnage in our history -- the previous year being the highest with just over 50,000 tons.

As mentioned earlier, transporting the fruit to our plants -- some $70,000 last year -- is included as part of the cost of operation. We returned two million dollars for the tonnage processed, or an average of $56 per ton. The packinghouse costs of handling, bin rental and cold storage must be deducted, but the grower netted approximately 2¢/lb. for the entire tonnage processed.

As we attempt to expand the portion of the tonnage into products requiring peeler fruit, we are hopeful of increasing this return. Much will depend on the tonnage we are expected to handle, the competitive market factors, and the prices we are able to maintain for our products.

7. Research and Development. We have been fortunate indeed to have had the excellent facilities of the government fruit by-products laboratory close at hand to assist in new product development. We are now adding a research and development department to our Company to devote full time to new product development to supplement the efforts of the research station.

We look to an increase of tonnage of apples in our area, largely through higher yields per acre due to more concentrated farming with dwarf trees, rather than through substantial increases in acreages. In addition, the processing arm of the industry will be expected to handle a larger percentage of the crop -- especially as our returns to the grower continue to increase.

8. Integration of the fresh and processed division of the industry. Our industry in the Okanagan Valley is ideally suited for a closely integrated fresh-processed operation because of the controlled marketing organization.

The processing division of the industry has been a balance wheel to handle surpluses in certain years. Conversely, this has presented its challenges in never knowing how much tonnage we might receive until the season was almost over. Careful market planning is most difficult under such circumstances.

Another problem we have encountered is a shortage of suitable varieties and tonnages for peeling. This year we have guaranteed the grower a firm price for the Rome Beauty variety. Considerable interest has been shown, even though this variety is diminishing. We are hopeful that this move may encourage growers to plant certain acreages of processing varieties specifically for processing. The big question at this time is whether a dual purpose fresh-processed variety is preferable to a strictly processing one. As we develop markets for these new products we must have assurance of certain tonnages. This in no way should affect the balance wheel function of our Company in the overall marketing picture.

2. THE PROGRAM OF THE NEW ZEALAND APPLE AND PEAR MARKETING BOARD

NAYLOR COLLIE
Factory Manager, Nelson Apple Cannery
New Zealand Apple and Pear Marketing Board
(Stoke, New Zealand)

The New Zealand Apple and Pear Marketing Board was established in 1949 as a result of negotiations between Government and the New Zealand Fruitgrowers' Federation. The Board controls marketing of apples and pears throughout New Zealand and all exports. It buys the fruit from the growers and sells on its own behalf, and, therefore, the Board takes the risk of the market and not the growers. The Board has no subscribed capital and its sole means of finance to start with was a Government guarantee.

Government Guarantee

The Government guarantees to the Industry that growers will receive the full cost of production, including recompense to the grower and interest of his investments. This guarantee is based on a cost of production survey. Each year the variation in material, labour and transport costs are reviewed and adjusted, the adjustments checked by Treasury Department. After the current annual costs have been verified, the Minister announces the current figure as being the Government Guarantee Rate.

The Guarantee is to the Industry as a whole and not to the individual. This means that should the overall net return for apples and pears fall below the Guarantee Rate, the Board would make a loss because the Board's aggregate purchase price for the apple and pear crops must equal the Guarantee Rate.

As the Government Guarantee covers all varieties and grades and sizes of apples and pears, the Board each year reviews market results and graduates compensation of varieties, grades and sizes, in relation to market returns and ensuring that the overall quantities average exactly equals the Guarantee Rate.

Although the general principle is that all apples and pears grown in New Zealand must be sold through the Board or its agents, there are certain

exceptions. Growers are free to sell to factories. The factory is granted a licence by the Board to purchase specified fruit up to a certain limit and under this licence the factory is free to bargain with any grower. The grower may also sell in a maximum of two case lots direct to the consumer, either by mail order or by sale at the orchard itself.

Marketing Board Cannery

The Board's Cannery was established in 1962 in Nelson, one of the major fruitgrowing districts, and was primarily designed to eliminate second grade fruit from the fresh fruit market. As the Board directs the Nelson growers to submit certain grades and varieties to the Cannery, the payment for these fruits are identical to that paid for the same grades and varieties in other districts, less the cost of packing and packing materials. In practice the Cannery is debited with the ruling rates for factory supply and the balance is carried to the Board's main trading account.

Whilst the Board makes every endeavor to provide the Cannery with the varieties, sizes and quantities it requires, the actual receipts from year to year depend very much on the fresh fruit marketing operation and the size and out-turn of the crop.

In summary, the Board looks to its Processing Division to provide an economical outlet for those apples and pears that are not readily saleable on the fresh fruit markets, due to unpopularity or excessive quantities of a variety, lack of colour, poor shape and size.

In effect, the Division is an integral part of the Board's marketing operations and plays its full part in the disposal of the New Zealand apple and pear crop.

B. DEVELOPING AN INNOVATIVE MARKETING STRATEGY: THE EXPERIENCE OF OCEAN SPRAY CRANBERRIES.*

EDWARD GELSTHORPE
Executive Vice President and General Manager
Ocean Spray Cranberries, Inc.
(Hanson, Mass.)

All businesses are essentially the same. The difference between a large and a small business is simply the number of digits in the financial statement. All businesses have marketing problems. By definition, marketing is simply finding a market, a customer, for the product you produce. This can be done by producing something for a market which exists or by innovating a truly new product for a presently non-existent market. True, the vocabulary of various businesses may differ and the number of dollars may differ, but the fundamental of trying to provide goods or services to a market and make a profit is identical in all business enterprises.

Business Management Tools

All businesses have the same tools to work with. Every business is a reflection of the manager who leads the business, and the tools that each manager has at his personal disposal are identical. The list of management tools could go on forever, but I believe there are eight which are of primary importance. They are as follows:

1. Intellectual Ability and Knowledge - Intellectual ability is what you have between the ears, and knowledge is what you do with what you have between your ears. The important point is not your intellectual ability but how you use it; not what you know or what capacity you have for learning, but how you use what you have to build knowledge. A good businessman must forever like to study and want to learn.

2. Competitive Instinct - You have to have a tremendous desire to win and a complete dissatisfaction with coming in second.

3. Energy-Loyalty-Enthusiasm-Courage - These are grouped together because they are essentially disciplines. Physical discipline to maintain high energy levels. Intellectual discipline to maintain loyalty and point-of-view discipline to maintain enthusiasm. Courage is a discipline of self-confidence. A good businessman must keep in training. His regimen of living with respect to food, sleep and exercise must be as conscientiously followed as that of a professional athlete. One can't play a good game of tennis if he is up all the night before any more than a good manager can do his job under the same circumstances.

4. Ability to Set Goals - To Plan Ahead - This is tougher than it sounds. It's even tough for use in our personal life to set goals and to have objectives and then to plan ahead so that our conduct works towards the achievement of these goals. Business goals aren't always obvious ... whether a company, for example, sets goals of quantity or quality, cheapest or the most expensive, bigger or smaller, to diversity or consolidate, etc., the decisions are not simple. The planning required to reach the goal set is not a specific route as is a railroad timetable which hits each city at an exact time. Rather, planning ahead is a course by which a ship navigates with a destination as a fixed point and business, as the ship, may slow down in a storm, heave to or veer off course. It may even change destination and set a new course when circumstances make it the most prudent or profitable move. However, for a ship and for a business there must always be a goal, and the navigator and the business manager must plan ahead if the goal is ever to be reached.

5. Imagination - A manager without imagination is a mechanic. Business must have good mechanics, the man who can do something well when the job is laid out for him, but mechanical ability without imagination will not make a manager. Imagination in business is so well demonstrated by the old story of the three stonecutters. When asked what they were doing, one stonecutter said he was making a living (all too often an employee's answer), the second stonecutter said he was doing the best job of stonecutting that he possibly could (a valuable employee), and the third stonecutter explained that he was building a beautiful cathedral ... here was the stonecutter with imagination for he saw the total end product of his efforts, and, thus, he had an important management asset.

6. Ability to Lead - First, one must be able to lead himself and then he must be able to hire good people and lead them. Andrew Carnegie understood hiring good people well because his epitaph reads, "Here lies a man who knew how to enlist in his services better men than himself." The small businessman in particular agrees with this principle but is frequently hesitant to actually hire a "better man than himself." Business leadership is never "Who is right" but rather "What is right." Easy to say, but we frequently forget it because personal bias can so easily upset leadership evaluation.

7. Ability to Sell - Every successful businessman must be a salesman, and it's much more than just selling your product. The toughest selling any businessman does is the internal selling within his own company ... selling ideas, selling people within the organization on their responsibility, and selling the goals of the company.

8. Understand Money - Recognize money as a commodity, a raw material of your business. Know how to use money, how much to borrow, how much you can be in debt for how long. The two prime problems with handling money are over-conservatism and imprudent optimism. A true understanding of money lies somewhere in between the two, and the best friend of any business must be its banker.

These eight business management questions must be understood and lived so that every action and decision coming from these eight points puts economic performance first. There are many wonderful and important non-economic results in a business enterprise ... civic responsibility, employee benefits, cultural contributions, etc., but if economic results fail, which means the failure to supply the goods or services of your company at a profit, then the company fails, and all of the important non-economic results cease to exist.

Ocean Spray's Experience

The Ocean Spray story is that of a business which up until four years ago had been essentially static. It happens to all businesses, and the causes of Ocean Spray's business becoming static was a relatively obvious marketing problem. Ocean Spray for years had been interested in selling cranberries the way the company wanted to sell rather than trying to find the various forms in which the consumer would be interested in buying cranberry products.

When the Pilgrims landed in 1620, they found the Indians used cranberries as a dye, a poultice for infected wounds, and as a seasoning when beaten into dried deer's meat to form pemmican. The Pilgrims used cranberries for the same purposes but soon found that when cranberries were boiled and sweetening was added, they formed a palatable jelly eaten primarily with wild turkey ... and because cranberries are harvested in the fall, thus the tradition of cranberries and Thanksgiving.

Ocean Spray became even more limited, in fact, in terms of satisfying consumer needs, because for many years it sold cranberries as fresh fruit, which the housewife then had to transform into an eatable product, or processed cranberries into cranberry sauce. After World War II the production of cranberries far outstripped consumption. As a matter of fact, per capita consumption of these two forms of cranberries was actually decreasing. Yet, Ocean Spray continued to spend substantial sums of money to sell only fresh cranberry sauce in spite of declining consumer interest.

The job, therefore, was a classic one ... how to transform cranberries into products for which consumer enthusiasm could be generated. There is no point in a bolt manufacturer manufacturing a wonderful bolt if not enough people are interested in using it and if the use of that particular bolt is not expanding.

Ocean Spray first had to generate monies to finance an aggressive new product development program. Every phase of the Ocean Spray operation was thoroughly investigated ... purchasing, production, personnel ... all of the traditional business areas. Efficiencies were effected, advertising on the two existing product forms was reduced, and these funds were poured into Research and Development. Within six months, Ocean Spray Cranberry Juice Cocktail, which had been sold for a number of years sporatically in various areas of the country, was re-formulated to have greater consumer acceptance and the package was re-designed as were all other Ocean Spray packages to more firmly identify the Ocean Spray trade mark. In August of 1963, national distribution of Ocean Spray Cranberry Juice Cocktail began, supported by national advertising, and in a year this product started the upward trend for a depressed industry with a surplus crop into a situation where the supply of cranberries and the consumer demand for cranberry products were in balance.

However, we are well aware that the consumer is a fickle person, and although today Cranberry Juice Cocktail may be highly popular, tomorrow a competitive drink may take the public fancy, so our efforts have increased in the new product area. The next new product to go national was Cranberry-Orange Relish which began its distribution in November of 1965. In April of 1966, Cranapple, a cranberry-apple drink, will be distributed nationally. Both these products are or will be supported by national advertising. Interestingly enough, the introduction of new products and the advertising they have received have raised the sales of tranditional cranberry sauce even though specific advertising and promotion on cranberry sauce is actually less than it was four years ago -- obviously the result of a rub-off of the total promotion on the Ocean Spray trademark.

During this time, Ocean Spray has embarked upon a unique new product effort, a chain of very successful Cranberry Houses, a retail restaurant-snack bar-bakery-gift operation, all designed to increase the consumer's approval and acceptance of cranberries as a versatile year-round product.

Ocean Spray also has moved heavily in supplying cranberries to the food manufacturers by providing other manufactureres product ideas to extend their new product line. Thus, we presently find Ocean Spray cranberries incorporated with TV dinners, muffin mixes, pies, etc.

At any one time, we have in the hopper <u>forty-five new product ideas</u>. This we believe, is a minimum number of ideas to be working on so that we may have a reasonable chance of introducing one major new product every eighteen months. Our ideas today range all the way from a ketchup-like cranberry condiment to candy to cocktail snacks. In three years, Ocean Spray's volume has moved from $28,000,000 to $50,000,000 and the price of cranberries to its growers has increased from $9.50 to $15.00, our advertising and promotion expense had doubled and over $5,000,00 have been spent on capital improvements. Ocean Spray has done this by employing the simple rule of marketing, that is, producing something for a market which exists or by

innovating a new product for a presently non-existent market. In no instance has Ocean Spray brought out a "Me-Too" product, and in no instance have we employed any business concepts other than intellectual ability and knowledge, competitive instinct, energy-loyalty-enthusiam, ability to set goals, imagination, ability to lead, to sell and we have understood money.

Obviously, three years of success are hardly more than a start, but by continuing to employ the same principles and with a reasonable amount of good luck necessary in any business enterprise, we believe we can keep the upward trend going.

July 1966

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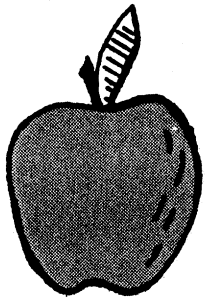
Processing An Expanding Apple Crop

Proceedings Report of the National Apple Industry Utilization Conference

University of Maryland
March 23-25, 1966



DEPARTMENT OF HORTICULTURE • UNIVERSITY OF MARYLAND
in cooperation with Federal Extension Service
U.S. Department of Agriculture

PROCESSING AN EXPANDING APPLE CROP

Edited by

DANA G. DALRYMPLE
Federal Extension Service
U. S. Department of Agriculture

and

BERNARD A. TWIGG
Department of Horticulture
University of Maryland

Conference Sponsors

National Apple Groups
National Apple Institute
International Apple Association
Processed Apples Institute

U. S. Department of Agriculture
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Department of Horticulture
Department of Agricultural Economics

INTRODUCTION

DANA G. DALRYMPLE
Conference Coordinator
Federal Extension Service
U. S. Department of Agriculture
(Washington, D. C.)

The National Apple Industry Utilization Conference was organized to facilitate evaluation of the problems and prospects of utilizing an expanding apple crop in processed form. All apple industry groups were involved: growers, processors, trade associations, State and Federal workers, commercial suppliers, etc. The Conference was, in fact, the first industry-wide meeting on apple processing. Attendance totaled approximately 150.

Conference sponsorship as noted on the title page, reflected the major segments of the industry. The sponsors, moreover, actively participated in each stage of the planning process. Individuals involved, other than myself, were: Fred P. Corey of the National Apple Institute, Fred W. Burrows of the International Apple Association, Thomas Rickenback of the Processed Apples Institute, C. H. Hills and W. L. Stanley of the U. S. Department of Agriculture (Eastern and Western Utilization Divisions, respectively), Bernard A. Twigg and Robert C. Wiley of the University of Maryland.*

Because of the industry-wide scope of the meeting, a comprehensive program was planned. Both economic and technical matters were included. The arrangement was such that the meeting moved from the more general to the more specific. Parts I and II of this report follow the same pattern. Hence those concerned with general issues may find the earlier portions of the report of greater interest; technologists may find the latter portions of Part II of special interest. Part III is devoted to industry-wide programs in other nations and other commodities.

Some of the subject matter included in the program was open to different shades of opinion. This was recognized at the outset, and provision was made for discussion periods following the various groupings of talks. As noted in the Preface, brief summaries of some of the discussions are included.

The Conference was not intended to answer all questions. Rather, the intent was to assist participants to recognize the more significant problems, and possible routes to a solution. It was those attending the conference to be stimulated -- with new knowledge, new ideas, and new contacts.

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* In addition, Messrs. Corey, Burrows, Rickenback and Twigg served as session moderators. B. A. Dominick, Jr., W. Smith Greig, and Shelby Robert also served as session or panel moderators. John Curtis was banquet toastmaster.

I. THE PROBLEM

A. THE NATIONAL APPLE INDUSTRY SITUATION

1. TRENDS IN PRODUCTION AND THEIR IMPLICATIONS FOR PROCESSING

a. NATIONAL APPLE PRODUCTION TRENDS

B. A. DOMINICK, JR.
Professor of Marketing
Cornell University
(Ithaca, N. Y.)

My assignment is to indicate the trends in apple production in the United States in terms of quantity, location and variety. Because of a time limit, I will present only a very broad sketch of the situation. The details will have to be filled in by other speakers and during the discussion period.

Long-Run Trends

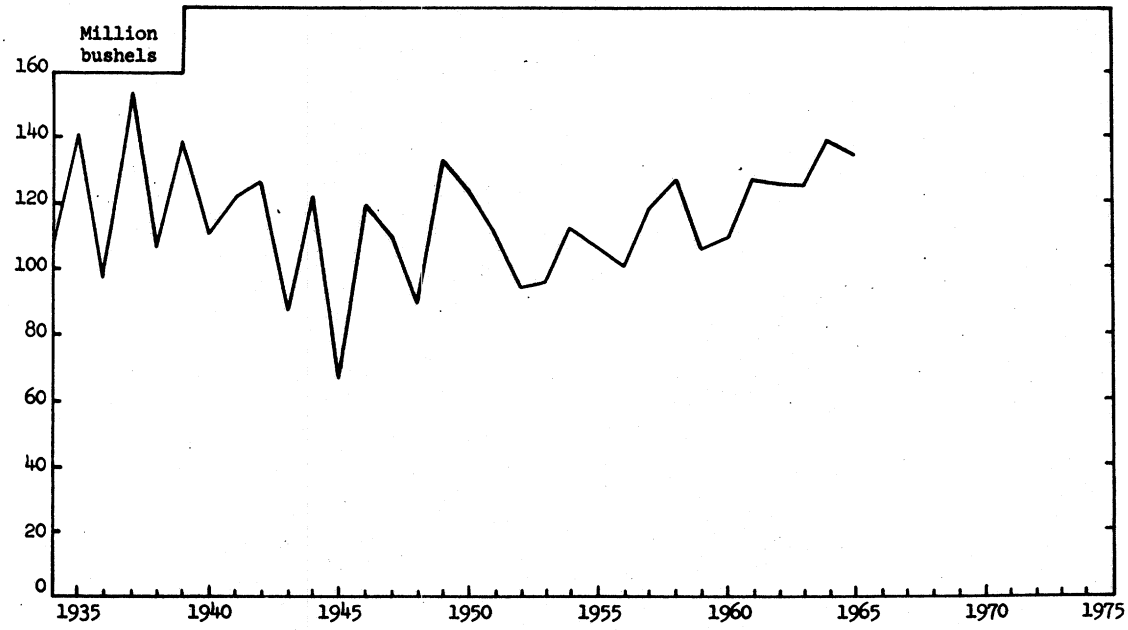
My analysis begins with 1934, the first year estimates of commercial apple production were reported. It continues to the present time with the latest data available. At least two points are important when we consider total apple production in the United States from 1934 through 1965 (Chart 1).

1. The trend in production was down from 1934 to the late 1940's at which time the trend reversed and production has been on the increase since then.

2. The annual year-to-year variation in production was much sharper from 1934 to 1950 than from 1950 to date. During the first half of this period the year-to-year variation averaged 35%. During the last half the annual variation averaged only 8%. This was a striking and significant change.

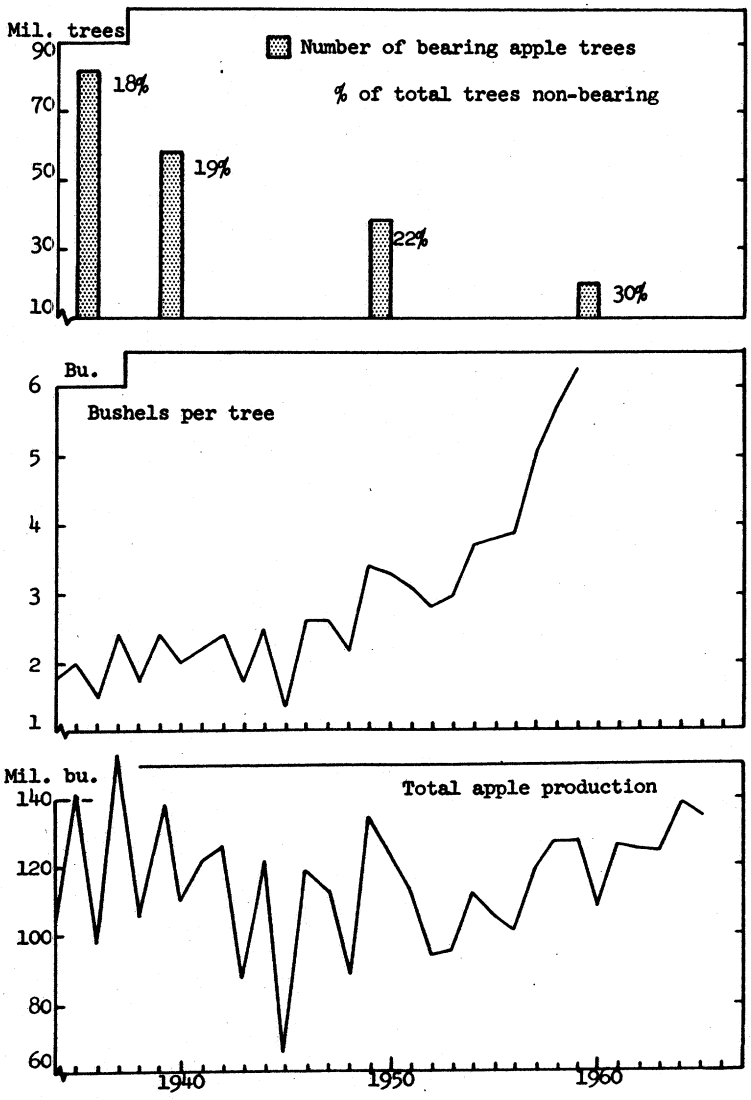
During this period of time a number of other important changes occurred. Among these, three stand out (Chart 2). First was the terrific decline in the number of bearing apple trees -- from 83 million in 1935 to 20 million in 1959, the last year for which data on a national basis are available. The second point is that yield per tree changed relatively little until the late 1940's and since then has increased dramatically. The third point is that the percent of young trees to total trees has increased and in 1959 was 30%. By the time the 1969 census is available it is entirely possible that the trend to fewer bearing trees in this country will be reserved for the first time in over 50 years.

The future trend in apple production will be the result of two factors. One is the continued increase in yield per tree and the other is an increase in the number of bearing trees. At least partly offsetting this double-barreled effect of increasing yield per tree and increasing tree numbers will be the increasing importance of size-controlling trees in new plantings. The influence of this trend is variable between states and is extremely difficult to assess.



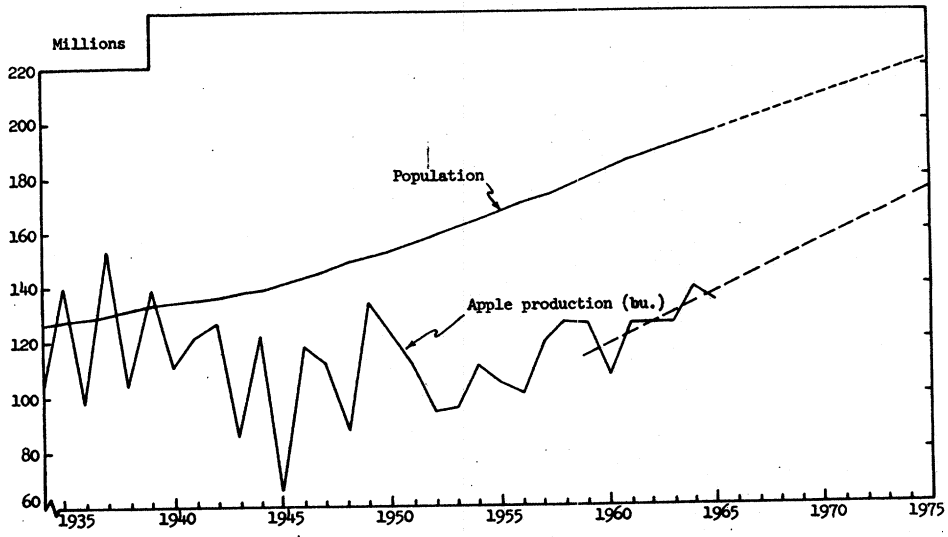
TOTAL APPLE PRODUCTION IN THE UNITED STATES, 1934-1965

Chart 1



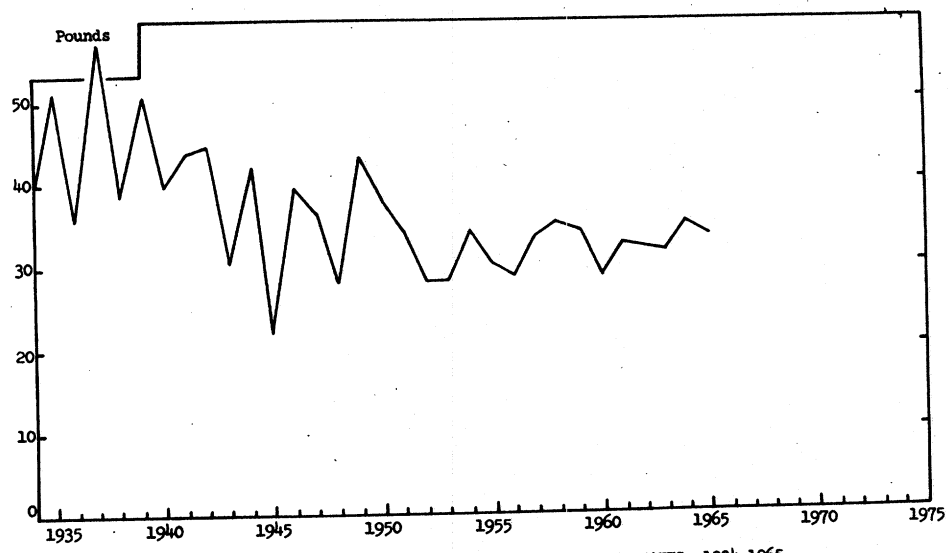
BEARING APPLE TREES, APPLE PRODUCTION PER TREE AND TOTAL APPLE PRODUCTION IN THE UNITED STATES, 1934-1965

Source:
Data are based on USDA statistics



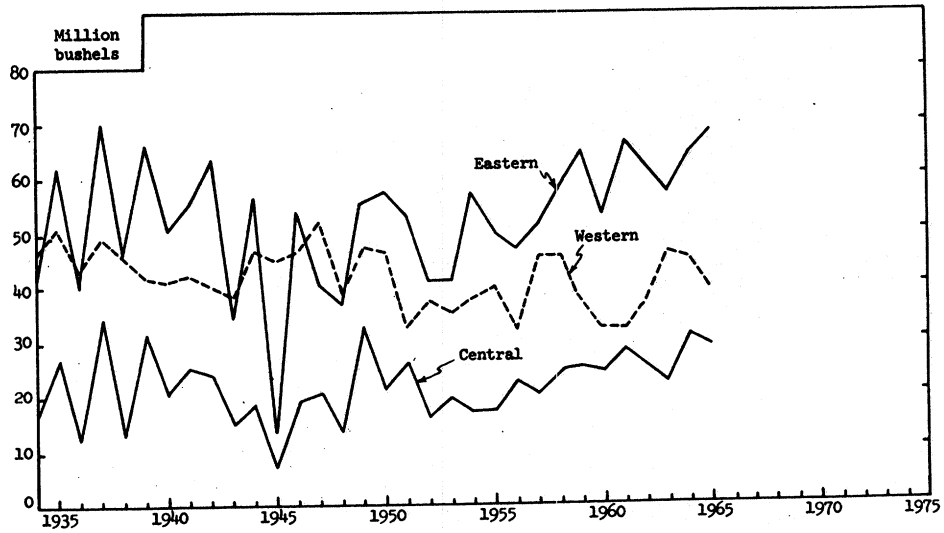
TOTAL APPLE PRODUCTION AND POPULATION IN THE UNITED STATES, 1934-1965

Chart 3



TOTAL APPLE PRODUCTION PER PERSON IN THE UNITED STATES, 1934-1965

Chart 4



TOTAL APPLE PRODUCTION IN THE UNITED STATES BY REGIONS, 1934-1965

Chart 5

Supply and Demand

Production must be looked out in relation to markets and probably the best indicator we have is population -- the number of potential apple eaters (Chart 3). Using the same scale at the left, annual apple production is shown in millions of bushels and population is given in millions of people. Since the early 1950's apple production and population have been increasing. Now they are in a real horse race.

Projection -- not forecasting -- of the trend in each of these variables shows apple production increasing faster than population. You can find lots of argument as to how these lines should be drawn. Perhaps the line for apple production is too steep. On the other hand, the trend in population is being re-studied and we may find that this line is too steep. I believe the trends point to an increasing number of pounds of apples produced per person. Unless some action is taken by the industry to avoid it, production will be considerably ahead of population in some years at least and serious industry problems will exist. This will be true even though the level of production may not increase much faster than the population level.

Dividing apple production by population gives the number of pounds of apples produced per person -- an indication of the magnitude of the annual marketing job (Chart 4). As was true for production, the year-to-year variation in apple production per person since 1950 has been much less than before that. An indication of an upward trend in amount produced per person can be seen by considering the last six years.

At the same time that production has been moving up, the total value of apples as they leave the nation's farms has increased. For the same general size crops, total value at the farm has generally increased. This indicates that the demand for apples has increased. Consider, for instance, the income from crops just short of 130 million bushels -- in 1942 the value was about 150 million dollars, by '58 it was 180 million, by '59 it was 210 million, by '61 it was about 220 million dollars. If this trend continues the increase in demand will offset at least part of the increase in per capita production of apples. The situation is somewhat complicated by the fact that the demand for processed apples has and is increasing at a faster rate than apples for fresh use. But certainly this indication of increasing over-all demand for apples is an encouraging one.

Geographic Variation

Trends in apple production since 1934 have varied considerably between different areas of the country (Chart 5). In the East, a rather sharp upward trend in production has existed since the middle 1940's. A modest-to-sharp upward trend has been apparent in the Central States since the middle 1940's. In the Western States a slight downward trend existed during the period from 1934 to 1950. Since then the production level appears to have been about constant.

Recent tree plantings in States in each of these regions indicate that these trends will change. The upward trend in production in the East will continue, but most likely not so steep. A sharp reversal in trend in the

West and a dramatic increase probably will take place as young trees come into production. Recent tree plantings in Michigan and several Central States indicate that the upward trend there will become even steeper as time passes.

Varietal Composition

Dramatic shifts have and are taking place in the varietal composition of the apple crop. My reference period here starts with 1947 because that was about the time the over-all level of apple production for the entire country started moving upward.

The production level of the traditional "processing" varieties has not changed since 1947 (Chart 6). Planting of young trees of these varieties in the important processing states indicates that no great increase in production in these varieties will take place in the near future. The total annual production of these varieties has also been remarkably stable to date.

Varieties generally thought of as being consumed in fresh form have been moving up the last five or six years even though the average production level for the last four years was only slightly higher than the first four (Chart 7). The big explosion in this group will occur in Delicious. It is possible that some of the projections of where this variety is going have been conservative.

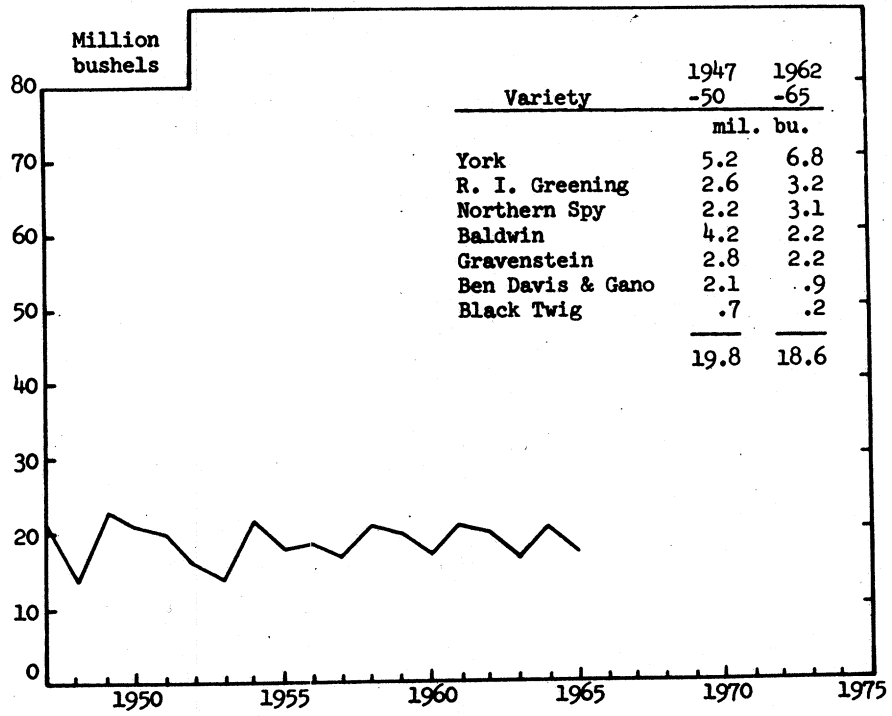
The remaining varieties are designated as "dual purpose" Chart 8). This is the group where the increasing amount of apples processed has come from. The upward trend in production since 1947 has been sharper here than in the other two variety classes. If the last four-year average is compared with the first four-year average, it may surprise you to know that the biggest bushel increase has been in Golden Delicious. This amount was followed by McIntosh.

The variation in trends among the different variety classes can best be seen when they are shown on one chart (Chart 9). "Fresh" and "Dual Purpose" varieties were in a real horse race from 1947 to 1958. For several years after that, it was no contest. But, the total of varieties classed as "Fresh" here will resume the race and could possibly catch and go ahead of the "Dual Purpose" varieties as classified here.

Of course, these remarks raise the question of what is a "Processing apple"? I am sure some effort will be directed toward answering this question during this conference.

* * *

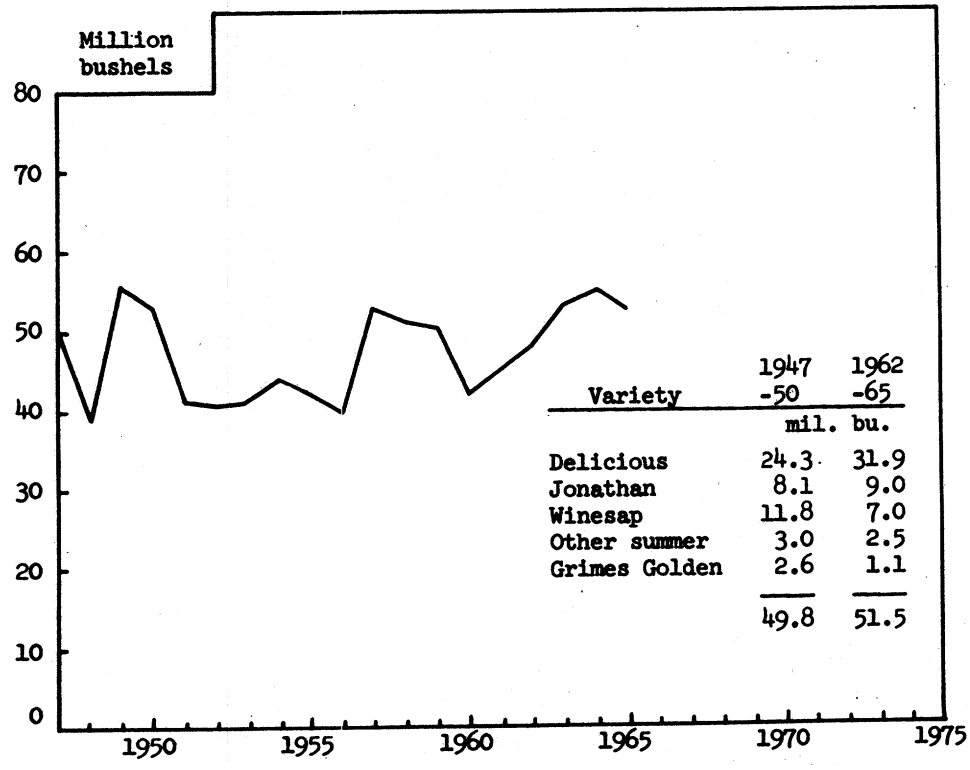
These are the trends in production as I see them in terms of the total crop, and in relation to population. I have also indicated the trends in production by variety classes and location of production within different regions of the United States. I have not related production to trends in population within regions because of limited time but different trends may well present problems of varying magnitudes to growers and processors in the different regions.



Variety	1947 -50	1962 -65
	mil.	bu.
York	5.2	6.8
R. I. Greening	2.6	3.2
Northern Spy	2.2	3.1
Baldwin	4.2	2.2
Gravenstein	2.8	2.2
Ben Davis & Gano	2.1	.9
Black Twig	.7	.2
	19.8	18.6

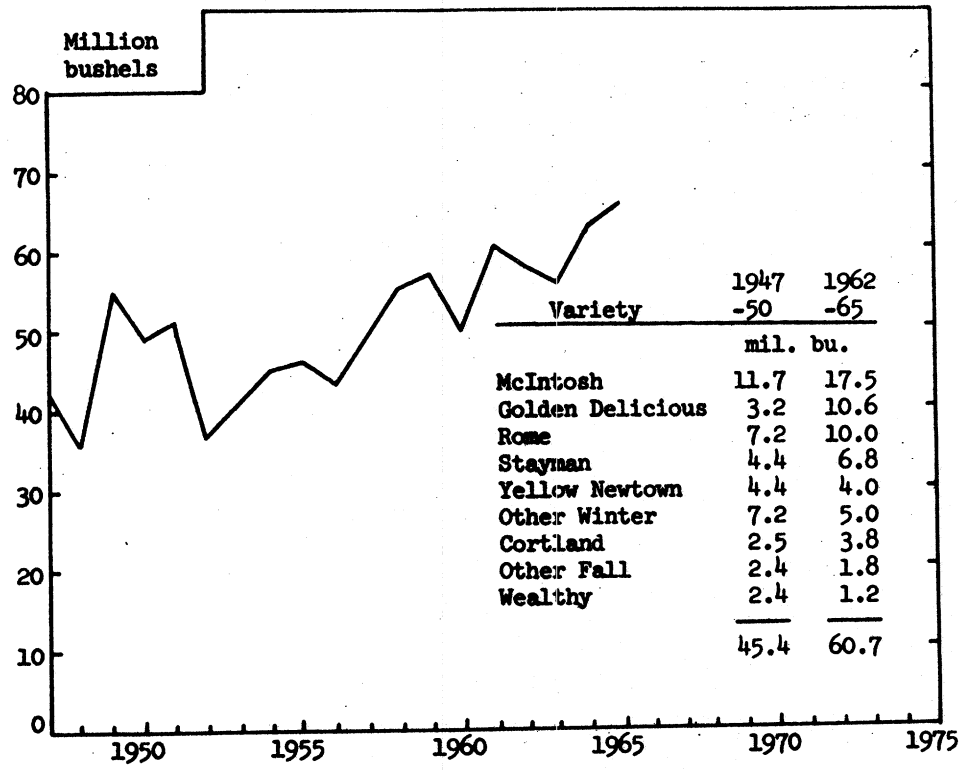
TOTAL PRODUCTION OF "PROCESSING" APPLE
VARIETIES IN THE UNITED STATES, 1947-1965

Chart 6



Variety	1947 -50	1962 -65
	mil.	bu.
Delicious	24.3	31.9
Jonathan	8.1	9.0
Winesap	11.8	7.0
Other summer	3.0	2.5
Grimes Golden	2.6	1.1
	49.8	51.5

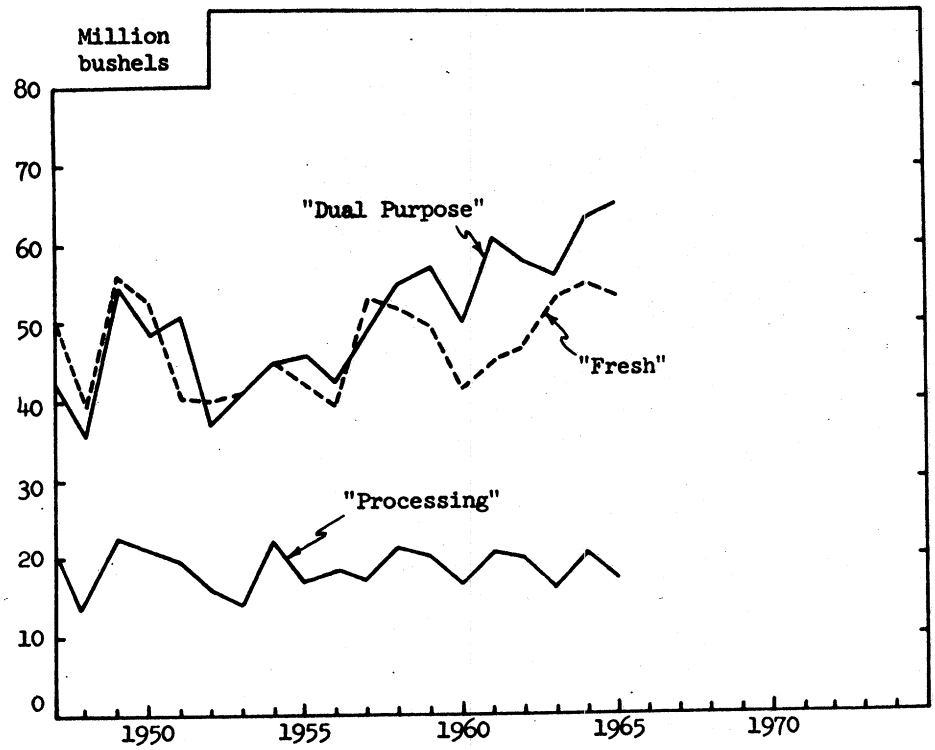
TOTAL PRODUCTION OF "FRESH" APPLE
VARIETIES IN THE UNITED STATES, 1947-1965



Variety	1947-50	1962-65
	mil. bu.	
McIntosh	11.7	17.5
Golden Delicious	3.2	10.6
Rome	7.2	10.0
Stayman	4.4	6.8
Yellow Newtown	4.4	4.0
Other Winter	7.2	5.0
Cortland	2.5	3.8
Other Fall	2.4	1.8
Wealthy	2.4	1.2
	45.4	60.7

TOTAL PRODUCTION OF "DUAL PURPOSE" APPLE VARIETIES
IN THE UNITED STATES, 1947-1965

Chart 8



TOTAL PRODUCTION OF APPLES IN THE UNITED STATES
BY VARIETY CLASSES, 1947-1965

Chart 9

b. APPLE PRODUCTION AND PROCESSING IN THE PACIFIC NORTHWEST

E. R. FRANKLIN
Extension Marketing Economist
Washington State University
(Pullman)

It is customary for speakers to, in some way, avoid the subject assigned to them. I have no desire to contravene custom. As I understand my assignment, I am supposed to talk about the apple production situation in the Pacific Northwest. I shall in fact confine most of my remarks to the situation in the State of Washington. This may not be too far from the subject inasmuch as Washington accounts for from 85 to 90% of the total apple production in the three Northwest states -- Idaho, Oregon, and Washington. To the extent that it is anticipated that I will devote all my time to a forecast of apple production, I will be disappointing.

Rather, it seems pertinent to me to discuss some of the peculiarities of the apple industry in Washington as related to the past and future behavior. Before I close I will give you my own guess as to Washington apple production in the near future. But this will be only in recognition of the economist's image as a soothsayer or witch doctor. I much prefer to provide you with some ideas and concepts which may help in interpreting the apple industry news as it comes from the Pacific Northwest.

Grower Behavior

I shall suggest three propositions concerning grower behavior:

Proposition number one is that although Washington growers have been madly adding to the number of apple trees in their orchards, they have no intention of producing apples for the processor. The Washington grower produces for the fresh market. That this is so could be illustrated in several ways. However, perhaps the best way is to take a look at the varieties of trees the growers have been planting.

In the reports of the five-year agricultural census from 1940 to 1955, the number of apple trees in Washington varied little -- from a low of 3-1/3 million to a high of 3-2/3 million. During the five-year period between 1955 and 1960 our growers were busy. The number of trees expanded by nearly 45% to 5.1 million.

For detail on varieties we must rely on surveys made within the State. These have been cooperative endeavors by many agencies in the State. The recent trends in plantings of apple varieties are revealed by comparing a census made in 1949 with one made in 1961 (Table 1).

Over and above the increased numbers of trees in the later survey, three facts stand out:

1. The proportion of Red Delicious trees has increased from less than 50% to almost 60%.

2. While Golden Delicious made up less than 4% of Washington apple trees in 1949, this variety had increased to nearly 19% by 1961.

3. The proportion of Washington apple trees accounted for by Winesaps and other varieties declined by more than half.

Table 1. Proportion of Apple Trees by Variety, Washington

Variety	1949	1961
Red Delicious	47.2%	59.1%
Golden Delicious	3.7	18.9
Winesaps	28.3	13.5
All Others	20.8	8.5
Total	100%	100%
(Number)	(3,631,800)	(5,241,900)

Source: A. H. Harrington, Washington Fruit Tree Census, Washington State University, Stations Circular 441.

In our part of the country, Red and Golden Delicious apples are intended for the fresh dessert. Winesaps have served as a late season fresh market apple, but CA-stored Delicious have been out-competing them in recent years. The Winesap apple is more acceptable to our processors than the Delicious. Thus, it is evident that our growers have been expanding plantings for fresh market and contracting plantings of apples considered desirable for processing.

The second proposition is that, if growers look upon the processing market as a means of disposing of any apples which the fresh market won't take, the processing industry also seems satisfied to be a disposal operation. Presumably, if a processor really wanted to compete with the fresh market for supplies of apples, he would bid a price high enough to attract some of those supplies. A review of prices (Table 2) indicated that for canning and freezing purposes, processors have been willing to pay occasionally only a little over half as much as the fresh market offers. Producers of dried apple products and other products have not been willing to pay as much as the canners and freezers.

Table 2. Price per Ton to Grower for Washington Apples by Kind of Use

Year	Fresh*	Canning and Freezing	Drying	Other Processing
1960	$120.83	$55.10	$39.60	$34.80
1961	120.83	62.00	55.80	47.90
1962	108.33	53.30	41.70	39.50
1963	79.17	42.10	27.50	42.90
1964	102.08	41.10	24.50	36.60

*Based on packinghouse door prices (net to grower above packing and storage charges). Fresh prices are normally quoted on a per bushel basis, but have been converted to a per ton basis for comparison basis.

This means, of course, that the processing industry in Washington has been and is depending on low-grade apples for its supplies. Under the Washington

market order, C-grade apples are not allowed on the fresh market except for those from the Golden Delicious crop. So in most years the processor is depending on C-grade and culls.

Earlier it was mentioned that the importance of the Winesap variety is declining in the Pacific Northwest. This is a variety which our processors preferred over the Red Delicious for processing. The rapid decline both in tree numbers and in production of Winesaps would indicate that the preference is not great enough to assure a price which would convince growers that the production of this variety should be maintained.

If processing in Washington is to become any more than a salvage operation, one of two conditions must be met: 1) If production were to increase and prices for the fresh product fall sufficiently, perhaps processors would bid for something other than low-grade fruit. This is problematical, however, for, under a surplus situation, we might find ourselves with more supplies than consumers of processed apple products could take. 2) If some innovator develops some new apple product with an unusually high consumer demand, perhaps processors could compete against the fresh market for apples.

Proposition number three is that mental attitudes of the industry are fundamental if processing is to represent more than a way for the fresh apple producer to dispose of apples the fresh market won't take. A number of years ago an old college professor remarked to me that "the trouble with too many people is that they know too many things that aren't so."

Our processing plant managers and our food technologists began telling me six years ago that Red Delicious apples are simply not a good processing apple. I understand that this belief is not confined to the Pacific Northwest, although there is an occasional instance where a processor has reported success with Red Delicious for some product. Whether or not it will always be true that Red Delicious are second rate for processing, I don't know. I do have some skepticism of present beliefs in this regard when I discover contradicting statements about Red Delicious in books on the technology of processing apples. There may be some things we need to learn about the behavior of various apple varieties under maturity and other conditions.

On the positive side, one of our processors has developed an important market for dehydrated apple powder and another has succeeded in marketing Red Delicious apples as juice.

So far, our growers have been resistant to any suggestion that there may be ways of reducing unit costs if an orchard were designed and operated with the specific objective of producing fruit for processing. Until recently our professional horticulturists were as resistant as the growers. We now have a man in the State who at least wonders whether different methods might not significantly reduce costs. Now it may be that the fresh market will always out compete the processed market for apples. It seems to me, however, that a proper attitude of mind will recognize that there may be possibilities as yet unrecognized or discovered.

Projected Production

At the outset I indicated my willingness to gaze into the crystal ball briefly for some kind of an estimate of the future for the apple production in Washington. It has been mentioned that the orchards of the State acquired 45% more apple trees between 1955 and 1960. When I first discovered this fact in 1961, I predicted that by about 1966 or 1967 we would have enough bearing surface in the State to produce a crop of around 35 million bushels. This compares with 31.9 million bushels in 1963, our last big crop, and with 24 million bushels in 1965. Washington had a damaging freeze during the winter of 1964-65. Trees in the Yakima Valley were hurt particularly. We are still trying to assess the damage. However, it appears that for the most part the apple trees we lost were old trees which would have been pulled within a few years anyway -- mostly Winesaps. Many other trees have required bridge grafting. We are losing 1,470 acres of orchard land to the Wells Dam, under construction on the Columbia River in the North Central part of the State. On the other hand, reports of our State Statistician and of our tree nurseries indicate that apple tree planting has been at a rate faster than required for maintenance of our orchards since the last census.

All in all, I think I shall stand on my earlier estimate -- sufficient bearing surface to average 35 million bushels during the 1966-70 period (Table 3). I have hedged myself by confining the prediction to an estimate of bearing surface. Frosts and freezes are not predictable, by me at least.

Table 3. Actual and Projected Average Production of Apples in Washington (in thousands of bushels)

Variety	Actual Average Production 1963	Actual Average Production 1965	Projected Average Production 1966 - 1970
Red Delicious	18,821	14,952	21,700
Golden Delicious	3,988	3,840	7,350
Winesaps	7,273	3,912	4,200
All Others	1,789	1,296	1,750
Total	31,900	24,000	35,000

Apple production in any particular area has a habit of fluctuating rather widely. An examination of Washington's record shows that since 1936, if any consecutive 5-year period be averaged the maximum fluctuation either above or below that average has been about 30%. Thus, in suggesting a potential average production of 35 million for the next five years we are suggesting that annual production should fall between 25 million and 45 million.

As suggested earlier the increased production will be in the Delicious varieties, both Red and Golden. The processor looking for an opportunity in Washington had better prepare himself to make use of these varieties.

c. ADAPTING TO CHANGING CONDITIONS*

W. SMITH GREIG
Associate Professor of Agricultural Economics
Michigan State University
(East Lansing)

Last June, Dr. Charles Slater and myself presented some materials at a meeting of the Processed Apple Institute.1/ A trade publication summary somewhat exaggerated one aspect of our presentation2/ and it is my understanding that this summary has been rather widely distributed. Today I plan to condense and, I hope, clarify and bring up-to-date some of the materials we presented at the Processed Apple Institute.

I. Problem Areas

I would like to start off by briefly discussing four problem areas in marketing an increasing quantity of apples. These are: 1) Utilization trends compared to production predicition, 2) Supply price relationships among apples and apple products, 3) Some variety problems, and 4) A projected changing location of the apple processing industry.

1. Utilization Trends Compared to Production Predicitions

Let's first briefly review the the trends in apple utilization and compare these trends to some prediction of production: If a trend of fresh apple consumption per person is developed and then this trend is projected based on U.S. apple consumption by 1975 would be for around 64 to 70 million bushels. A similar procedure on processed apples (canned sauce and slices, canned apple juice, frozen slices and dehydrated apples) would yield a primary utilication of around 123 million bushels of apples by 1975. Cider, vinegar, and exports would increase this by another 11 to 12 million bushels to bring total utilization to around 135 million bushels per year.

However, estimates of future production are well above these projections of past trends. The International Apple Association 1970 production estimate is nearly 20 million bushels above trends in consumption; the American Can Company estimates 27 million bushels above. By 1975, the American Can Company estimate is for a crop of 181 million bushels, 46 million bushels above utilization trends.

Undoubtedly, consumption trends will change radically and in most likelihood the projected large apple crops will be completely utilized. I do not use the term surplus in the context of an excess to be left on the trees to rot. It would be a surplus in terms of past utilization trends. However, it could also probably be a surplus in terms of quantities which would yield a profitable price to producers. The projected large crops of apples are real, the large supplies could result in serious problems. How to handle this potential

*Dr. Greig's original talk was illustrated with 12 charts and tables. These figures are not included here, but are reproduced in a mimeographed version of the talk which may be obtained by writing Dr. Greig.

1/ Charles C. Slater and W. Smith Greig, "Marketing Problems in Expanding Apple Products Consumption". Presented at the Processed Apple Institute, White Sulphur Springs, West Virginia, June 11, 1965.

2/ Staff Report, "40 Million Bushel Surplus of Apples", Food Processing and Marketing, October 1965.

large supplies of apples, I am sure is one of the purposes of this conference.

2. Problems of Supply-Price Relationships

If the sizes of the predicted crops actually materialize, will prices fall and if so, how far? While there have been many studies on price-quantity relationships in apple marketing, there has not been too much agreement among authors.3/ Several studies have indicated that if total production of apples increases, the total returns for the sale of the crop increases only slightly.

Some studies have also shown little differences in the elasticities of demand at the farm level between apples for fresh market and apples for processing.4/ The elasticity of demand is merely a term to express changes in the quantities demand with a change in price. If there are differences in the elasticities of demand among apples for fresh market and apples for processing, it is possible to maximize total returns by a utilization model, by restricting utilization in the products with the least elastic demand and placing the surpluses in the products with the higher elasticities of demand.

A few years ago we determined some price-quantity relationships among fresh apples and some processed apple products at the retail level. These data showed much higher elasticities of demand for processed apple products than for fresh apples.5/ A 10% change in price of fresh apples at retail resulted in a change in the quantities demanded (in the opposite direction) of only 3.5% (or an elasticity of demand of -0.35). However, a change of 10% in the prices of applesauce resulted in a 44% change in the quantities demanded (an elasticity of -4.4), and a 10% change in the prices of apple juice resulted in a change of 23 percent in the quantities demanded.

These data are for the years 1953-57 and are somewhat dated. However, I know of no more recent data at the retail level. Moreover, there is no reason to think the relative retail elasticities have changed materially. While these results have not been tested in controlled retail experimentation with apples, controlled retail sales tests on potatoes showed that a 50% change in prices of fresh potatoes resulted in a change in sales (in the opposite direction) of 20%, while a change in prices of 30% for dehydrated mashed potatoes resulted in a change in sales of 67%.6/

3/ See Dana G. Dalrymple, "Some Economic Considerations in Assessing Diversion Programs for Apples, "U. S. Department of Agriculture, Federal Extension Service, February 1964.

4/ William G. Tomek, An Analysis of Changes in Utilization of Apples in the U.S., Cornell University, Dept. of Agricultural Economics, A.E. Res 137, December, 1963

5/ W. Smith Greig, Maximizing Total Dollar Sales and Apple Products by a Utilization Model, Michigan State University, Ag. Econ. Mimeo, Aug. 1962.

6/ W. Smith Greig, Forrest Strand, and Henry Larzelere, Relative Sales and the Elasticity of Demand for Dehydrated Mashed Potatoes, Michigan State University, Ag. Econ. Mimeo 732, July 1958.

The significance of these data on apples and on potatoes is that it is much more difficult to increase sales of fresh apples or potatoes at retail by price reductions than for their processed counterparts. Fresh apple sales stay relatively stable with variations in price (more inelastic demand) while processed apple consumption increases significantly with reductions in price (more highly elastic demand). These data, together with past utilization trends, would suggest that the large increase in per capita consumption which will be necessary to utilize a crop of 154 to 182 million bushels of apples by 1975 will come largely from increased utilization by the processing sector. Further, these data have some implication for advertising programs. Most economists would agree that a product with a greater elasticity of demand is more responsive to advertising than one with a lower elasticity.

3. The Variety Problem

It has been general knowledge that the increased plantings of apples have been "fresh" varieties, while fresh consumption has been decreasing and processing has been increasing. The exact nature of the recent plantings have again been specified by Mr. Magleby of the American Can Company.7/

In 1960, our Michigan growers were concerned over this developing problem and asked us to look into it. We took our five principal varieties of apples and had them made into apple pies, apple sauce, and spiced apple rings and then conducted consumer preference panels on the differences in varieties.8/ Oddly enough there were no significant preferences among apple pies made from Red Delicious, Norther Spy, R.I. Greening, Jonathan and McIntosh varieties. In apple sauce appearance, Red Delicious was significantly preferred over all other varieties; and in taste preferences, Red Delicious ranked fairly well. In spiced apple rings, Delicious ranked second only to Golden Grimes in appearance and second only to Jonathan in taste. In summarizing 11 tests on appearance and taste of the five major Michigan varieties, I would say that many of the current institutional preferences or prejudices in varieties of apples for processing do not reflect consumer preferences. In our tests the Red Delicious ranked at or near the top both in fresh and processed forms. Costs of processing differences were not measured. However, these data indicate that the so-called "fresh" varieties can and probably will be extensively processed in the future. In fact, it is estimated that 40% of the 1964 Red Delicious crop in Michigan was processed. Studies in Washington State have indicated consumers have no preference against apple juice containing as much as 70% Red Delicious.

4. Problems of the Changing Location of the Apple Processing Industry

Partially associated with the variety problem is the potential change in location of the apple processing industry. The biggest increases projected for apple production are in Michigan and in the West, particularly Washington.

7/ Richard S. Magleby, "Projected Production of Major Apple Varieties, American Can Company, January 1965.

8/ W. Smith Greig, C. L. Bedford and H. E. Larzelere, "Consumer Preferences Among Apple Varieties in Fresh and Processed Forms," Quarterly Bulletin, Michigan State University, Agricultural Experiment Station, February 1962 (Vol. 44, No. 3), pp. 505-526.

Thus, if the trend toward increased processing continues and if the so-called fresh varieties become acceptable for processing, the processing industry may move Westward.

The economics of this move can be partially measured by programming a minimum cost distribution system of current processing.9/ I have developed a minimum cost rail distribution system for canned apple products for 1961. No other distribution system would result in less total transportation costs to move all the canned apples from points of production to points of consumption. Through this system the marginal cost of transporation can be approximately determined. The marginal cost is the cost of the last unit to be shipped or that unit which must be shipped the greatest distance.

Because New York processes the most canned apples it must distribute them farther. This means that its marginal freight costs (the cost of shipping the last unit) are the greatest. For example, relative New York marginal costs per 100# shipped are $1.08 more than California or Washington and 31 cents more than Michigan. Thus with expanding production, Michigan, California and Washington would initially have a considerable comparative advantage in freight costs to market. Of course, freight costs are only one of many factors in determining location advantage in processing.

5. Summary of Problems

I have briefly touched on four problem areas:

1. Predictions of production to 1975 are much larger than trends in consumption. Trends in per capita fresh utilization are down; per capita processed utilization is up.

2. The elasticity of demand at retail is evidently much larger for processed products than for fresh apples.

3. Many of the so-called "fresh" varieties will undoubtedly be processed in the future.

4. Processing of apples will probably move Westward.

II. Alternative Solutions

What are some of the alternative approaches that might be used to lessen the effect of the potential large supply of apples? Much of this conference is to be devoted to new product development and advertising promotion. An alternative to these programs are programs of supply control. Although I am not an advocate of supply control, and I would much rather discuss new product development or advertising and promotion, the conference would be derelict in its duties to the audience if supply control were not included as a possibility of increasing grower-processor returns.

9/ W. Smith Greig, Locational Effects of New Technologies in Fruit and Vegetable Processing, Michigan State University, Agr. Econ. Report No. 6, May 1965.

1. Supply Control

Supply may be controlled through the price mechanism. Or, rather simply stated, if growers lose enough money through ruinously low prices, they will pull out their orchards. In any given year, however, growers will normally harvest a crop as long as prices are above harvest costs.

An alternative to removal of orchards through the price mechanism is the possibility of legalized production control. At the present time, federal market orders and agreements cannot "regulate a producer in his capacity to produce." However, some state marketing orders, notably California, do have the authority to control production. State marketing orders and current federal orders, in my opinion, will have little effect on the potential problems of oversupply; however, the federal orders could be changed through legislation to become an effective supply mechanism. I am not recommending this course of action, but it is a possibility which could be demanded by grower groups if prices reach low levels over several years.

2. Utilization Controls

If total supply control isn't too promising, how about utilization control? Is it possible to increase total returns by controlling the quantities going into different forms of utilization? Theoretically the answer is definitely yes, but practically speaking utilization control would be very difficult. From our limited data on relative retail demand elasticities at retail, the correct approach could be to limit the quantities sold fresh and to process the rest of the crop. The dairy industry uses utilization control very effectively. The key to whether utilization control would be effective is in the relative elasticities of demand for different products. The data available on elasticities of demand are very weak. The Michigan State University data I quoted was from a household panel of 250 families who were interviewed each week for five years on the quantities of food purchased and the prices paid. This panel was discontinued in 1958.

One of the basic needs of the apple industry is some new good data on the relative elasticity of demand for apples and apple products at the retail or consumer level. Governmental statistics are so aggregated that much meaningfulness is lost. Any method to generate these data are costly. Perhaps the best approach would be some controlled retail experimentation of the effect of price on quantities sold. Good data on relative elasticities of demand could be a starting point for determining the best utilization allocations and also a basic key in determining the most appropriate use of advertising expenditures.

3. Increasing Demand

The basic ways to increase demand is to alter the consumer image of your product or to alter the products to fit current consumer preferences or prejudices. That is, by advertising and promotion or through new product development. I have already mentioned what I consider to be a very important relationship between advertising expenditures and demand elasticities so I will go directly into new product development.

Total per capita potato consumption in the U.S. had historically declined in the U.S. for over 100 years until around 1956. Between 1956 and 1963,

per capita potato consumption increased nearly 10%. This was primarily due to new uses of potatoes, dehydrated mashed potatoes, frozen french fries and a continued increase in consumption of potato chips. Fresh potato consumption has continued to decline.

Total apple consumption not only can be increased, it must be increased, or the industry may face some difficult years. One of the best ways of increasing consumption is to alter the product to fit current consumers prejudices and preferences by new product development.

A whole host of basic new processing technologies have been provided by federal or state agencies: vacuum concentration with essence recovery, the EURDD process for crystallation of juices, dehydrofreezing, flake-drying, foam-mat drying, and explosive puffing were developed by USDA laboratories. CA Storage was adopted by Smock of Cornell from British work. The English government was largely responsible for early work in freeze-drying and our Quartermaster Corp and the Atomic Energy Commission for work in irradiation. In addition to the technological and engineering aspects of new product development, some work is also being done by economists of the USDA and land-grant colleges in market testing of new products. Much of these areas will be discussed in some detail later in this conference. A concentrated industry approach in the area of new product development and in advertising and promotion could go far in alleviating what appears to be an impending oversupply of apples.

4. Some Comments on Location

New product development can change location advantages very rapidly. For example, if dehydrated apple slices and apple sauce were to replace canned products, then the least cost distribution system could change sharply. Because New York has had the highest marginal distribution costs in canned apples they would gain proportionately over other processing areas in processing dehydrated products.

Processing locations are continually shifting. The shifts result from changes in economic efficiency and result in greater economic efficiency. While I think apple processing will tend to move Westward, there are many fixed factors to cause it to remain where it currently is. Continuous studies should be conducted by both producers and processors to determine the future most economic locations. Different products probably demand completely different processing locations. In location economies I hope no artifical barriers are built into the apple industry to prevent increasing economic efficiency. I say this because some proposed market orders and agreements for fruits and vegetables (notably the proposed federal market order on potatoes) would, in my opinion, have tended to stabilize industries where they are now. Let's keep a free market in location of the apple industry and may the most suited area or areas win.

DISCUSSION

The discussion centered largely about several points raised in Dr. Greig's paper. Some growers were disturbed by the connotations of the word surplus and felt that it was inappropriate. Several others were bothered by the comparative value of per capita consumption figures - suggesting that they

measured only disappearance from the farm and did not reflect actual intake by the consumer. They felt that due to improved storage and handling, spoilage is less today than it was years ago. Therefore, actual fresh consumption may not have declined as much in the last few years as is at first evident.

2. THE PRICE-MAKING PROCESS AT THE GROWER-PROCESSOR LEVEL

a. PRICE ANALYSIS -- PRACTICES AND POTENTIAL

DENNIS L. OLDENSTADT
Extension Marketing Economist
Washington State University
(Pullman)

The assigned topic, "Pricing Processing Apples at the Grower-Processor Level", has been divided into two parts. I shall discuss the general characteristics, the potential benefits and limitations of price analysis and briefly summarize the "Michigan Analysis".1/ The speaker to follow will discuss revisions of the analysis that he has made and deal with some needed refinements and extensions of the analysis.

Definition and Application

Price analysis has as a primary objective the discovery and measurement of factors associated with movements in price. Once the association between price and the factors affecting it can be determined, two uses can be made of the information. First, it is possible to predict with a certain level of accuracy the price which will prevail at some future point in time. Secondly, the technical coefficients obtained from a price analysis may be used to determine the variable effects of alternative public or private policy decisions.

A few examples may help to understand the usefulness of price analysis. A group of producers of an agricultural commodity wish to bargain with processors for the price of the produce and other terms of trade before the crop is harvested. They use predictions of price from a price analysis as a basis from which to start their negotiations. A processor of food commodities uses large quantities of two particular agricultural products in the production of a high volume food product. The processing firm employs an elaborate price analysis which can predict prices of these raw products two months in advance. They make one of two alternative purchasing decisions every two months: 1) to buy a two-month supply of raw product immediately, or 2) to purchase on a "hand-to-month" basis in anticipation of lower raw product prices in the future. An average saving of even one-quarter of a cent per pound on 10 million pounds of raw product per year means a total saving of $25,000. Another example includes the producer group which was considering a supply control program to reduce the number of marketable units hoping to obtain a price increase. A price analysis indicated that the relationship between the quantity consumers were willing to purchase at various prices was such

1/ E. C. Pasour and D. L. Oldenstadt, Farm Prices of Apples for Canning and Freezing, United States, 1951-61, USDA, Agricultural Economic Report No. 35, June 1963, 20 pp. Prepared while the authors were station-

that a supply control program would actually reduce gross revenue. The proposal to limit the supply was therefore abandoned.

Despite examples which make price analysis appear to be an indispensable tool for private and public policy decisions, there are cases where existing price analyses and pricing formulas simply cannot be of much assistance. Most analyses are based on historical data. In a market characterized by a rapidly changing technological and organization structure, these historical relationships are no longer completely valid. In these cases price predicitions or price formulas may produce sizeable errors. Sudden changes in the entire structure of prices, such as may occur in periods of inflation or recession, also limit the usefulness of price analyses which is based on a different time period. Some of the factors which effect price cannot be measured quantitatively. New product development, the effects of advertising and promotion, the effects of substitute products, quality factors, and changes in consumers' tastes and preferences are a few of the less measureable factors affecting price. In other cases, regional differences in markets may be averaged out in a study which utilizes U.S. data.

These difficulties, however, produce a challenge as well as a problem to the price analyst and to the user of the results. The challenge for price analysts is to develop improved procedures for handling the dynamic nature of our markets in future price analysis work. The challenge for those attempting to use the results of a price analysis is to understand their limitations and be willing to modify the number of results with good, subjective evaluations. This requires market knowledge and experience.

Michigan Price Analysis

Now let us turn to the apple price analysis completed at Michigan State University in 1963. The motivation for the study grew out of meetings between the Michigan Agricultural Commodities Marketing Association (MACMA), an affiliate of the American Agricultural Marketing Association, and members of the Department of Agricultural Economics at Michigan State University. The Department, in cooperation with the Marketing Economics Division of the Economic Research Service, USDA, had been doing price analyses on tart cherries on an annual basis for a number of years. Moreover, Dana Dalrymple, then a graduate student in the Department, had done a preliminary price analysis for canning and freezing apples which helped lay the ground work.2/

(MACMA) developed a sizeable membership of processing apple growers with the hope of negotiating prices with processors. Similar organizations in other states were working toward the same goal. They wanted to know the nature of the price making forces.

On a national basis, approximately one-third of all apples produced in the commercial apple areas have been used for processing. Some states process as much as 50% of their annual apple crop. Other states like Washington process a much smaller portion, perhaps between 10 and 15%. The portion of the total apple crop going into canned and frozen apple slices and canned apple sauce reached 20% in 1959 and 1960. It has increased each year since then and reached 22.3% in 1964.

2/ Dana G. Dalrymple, "Economic Aspects of Apple Marketing in the United States," Michigan State University, Ph.D. dissertation, 1962, pp. 292-297.

Normally, about 60% of the total quantity of processed apple products is made up of canned and frozen apple slices and canned apple sauce. The remaining 40% is utilized for drying, vinegar, juice, apple rings, and other miscellaneous products. Thus, canned and frozen apple slices and canned apple sauce dominate the processing market. And since quantities produced and prices of other processed products are not reported, it was decided to concentrate the analysis on the canning and freezing portion of the processed market.

The objectives of the analysis were:

1) To determine the major factors associated with season average farm price of canning and freezing apples;

2) To determine how much of the total variation in season average farm price was accounted for by changes in the associated factors; and

3) To develop a statistical relationship which could be used to estimate farm price of canning and freezing apples before and during the harvest season.

Years studied: The apple industry as a whole has changed considerably since the 1940's. The capita consumption of all types of apples and apple products on a fresh equivalent basis has changed little since World War II. But per capita consumption of processed products has trended upward while fresh per capita consumption has declined. In addition, the composition of consumption of processed products has changed. Per capita consumption of dried apple and frozen apple slice consumption has remained rather stable. Because of these changes in consumption and the related changes in the processed industry, it was decided to limit the analysis to the period 1951-1961.

Months studied: Prices growers receive for canning and freezing apples are usually established near the beginning of the harvest period. They may be adjusted later depending upon how supply and demand conditions develop during the harvesting season. Because of these price adjustments, the four months of July, August, September and October were selected. Season average grower price of canning and freezing apples was related to factors in each of these four months. In essence, then, we had four separate sets of independent variables, one set for each month, to relate to season average grower price.

The advantage of this procedure over the alternative of using end-of-season data was that information on the factors associated with price would be available before the end of the harvesting season. Thus, price forecasts could be made prior to the end of the harvesting season without having to make estimates of the final or end-of-season values of the variables.

Variables studied: Farm price of canning and freezing apples was the dependent variable that was to be explained by the independent variables. The independent variables selected were: 1) The apple crop estimate, 2) Stocks of canned and frozen apple slices and canned apple sauce, 3) Farm price of fresh apples, and 4) A trend variable, 1951=0, 1952=1 ... 1961=10. Each of the first three independent variables are estimated by the U.S. Department of Agriculture on a monthly basis beginning in July of each year.

The apple crop estimates are reported on a bushel basis. In order to combine the canned and frozen stock figures, they were converted to raw product equivalents.

The price of fresh apples was included as an independent variable on the basis they are a partial substitute for canned and frozen apple products as far as homemakers and institutional users are concerned. In addition, prices of fresh and processed apples are partially tied together as far as producers are concerned since several so-called dual-purpose varieties can be sold either fresh or for processing. Thus, processors of apple products must maintain some realistic balance between fresh and processed apple prices in order to insure themselves an adequate supply of the dual-purpose varieties.

All data on prices were deflated by the Bureau of Labor Statistics Wholesale Price Index to account for changes in the purchasing power of the dollar. Data on crop estimates and stocks were placed on a per capita basis to remove influences of changes in population numbers.

Least square multiple regression techniques were then used to estimate the relationship between farm prices of canning and freezing apples and the associated factors described above. The results for each of the four months are shown in Table 1.

Table 1. Regression Coefficients Obtained from the July, August, September and October Estimated Relationships for Canning and Freezing Apples

Month	Intercept (a)	Regression coefficient of-- Crop estimate (b_1)	Stocks (b_2)	Fresh price (b_3)	Trend (b_4)	Coefficient of multiple determination (R^2)
July	131.54	-112.1	-20.4	6.1	-0.22 1/	0.91
August	80.86	- 83.1	-12.6	18.0	-1.1	0.92
September	47.27	- 51.9	-15.2	26.0	-1.5	0.94
October	64.19	- 43.7	-18.7	17.5	- .15 1/	0.93

1/ Not significantly different from zero at the 20% level of confidence.

For the July relationship the following results were obtained. A change of 0.1 bushel per capita in the July crop estimate, considered by itself, was associated with an opposite change of $0.56 per cwt. ($11.20 per ton) in the deflated season average grower price of canning and freezing apples.3/ Converting to total bushels and 1962 prices, this meant that a change of 18.5 million bushels in the July crop estimate was associated with an opposite change of about $0.67 per cwt. in the grower price of canning and freezing apples. Alternatively, a change of 1.85 million bushels was associated with an opposite change of about $0.07 per cwt.

3/ All changes in variables are changes from the average values of these variables over the period studied.

A change in July stocks of 0.1 pound per capita, considered by itself, was associated with an opposite change of $0.10 per cwt. ($2.04 per ton) in the deflated season average grower price of canning and freezing apples. At the 1962 levels of population and prices, this meant a change of 18.5 million pounds (raw product equivalents) in July stocks of canned and frozen apple slices and canned apple sauce was associated with an opposite change of $0.12 in season average grower price of canning and freezing apples.

A change of $0.10 per bushel in the deflated July price of fresh apples, considered by itself, was associated with a change in the same direction of $0.03 per cwt. ($0.61 per ton) in the deflated season average farm price of canning and freezing apples. At 1962 price levels, these prices would be $0.036 and $0.73 respectively.

In the July relationship, the effect of the trend variable was not significant. However, over the 10-year period studied, farm price of canning and freezing did decline slightly.

About 91% of the variation in farm prices of canning and freezing apples was explained by the variables in the July relationship.

Implications

You may be wondering at this point what conclusions are appropriate regarding the potential for price analysis in your individual areas of activity. I believe that the current events surrounding our apple industry and the direction in which our entire agricultural marketing complex is heading makes it imperative that we all become more concerned with price analysis as well as other broader aspects of economic analysis. The numbers of farms and farmers is declining. Mergers and acquisitions in processing, wholesaling and retailing are also occurring at a rapid pace. Production and marketing of agricultural products is becoming more regionalized and specialized. Technological advance in production and marketing are also increasing at an expanding pace.

As these changes occur, the opportunities increase in the apple industry for developing improved and enlightened marketing programs and approaches. As a matter of fact, the need to develop new concepts and approaches to marketing becomes imperative to the future profitability and survival of many apple producing and marketing firms. But perhaps most importantly, the evaluation of alternatives and selection of the most profitable solutions will require the very best kind of price and economic analyses that can be made available.

b. PRICE ANALYSIS AS A TOOL IN APPLE MARKETING

DONALD J. RICKS
Assistant Professor of Agricultural Economics
Michigan State University
(East Lansing)

As the previous speaker has mentioned, price analysis can be useful in several types of marketing decisions. I would like to concentrate, in the

short time that I have today, upon the use of price analysis as an aid in pricing a given year's crop.

For this purpose, price analysis can provide a useful tool for both processor and grower groups. For processors, price analysis can help answer the crucial question: At what price can a given size of pack be moved -- without a burdensome carryover at the end of the year? For growers and grower groups, price analysis can help answer the similar question: At what price can a given size crop of processing apples be sold? You can readily see that these two questions are closely related. Growers must have a good idea of what price processors can obtain for the resulting pack in order to determine a realistic farm price.

I would like to emphasize at the outset that, although I believe that it can be a useful tool, historical price analysis does not result in a magic formula which will provide all the answers. It can help in pricing decisions, however. These pricing decisions must be made every year -- they are inescapable. In one way or another, the people involved must make their best estimate of what prices will be, or what prices should be, in order to move a given crop or pack.

No matter what method is used, any price prediction must be based upon past experience of market and economic conditions. One must evaluate past effects upon apple prices of such factors as: crop size or pack, carryover, the competing products situation, new products, changes in consumer tastes, success of advertising, customers buying policies, population, consumer income, and a variety of other factors. Of course, the past experience is evaluated in light of expected future changes.

After one has studied the past relationships of price-determining factors to apple prices (either in a formal or informal way), he must also make an accurate appraisal of the current or future situation in regard to each of these factors. Thus, he can arrive at an accurate price prediction. In this context, the accuracy of such unknowns as the crop estimate is very important.

Apple Price Analysis

Where can statistical price analysis help in this process? Statistical price analysis can help in the price-prediction process by providing a systematic means of describing the past relationships of major supply and demand factors to prices. This is usually done for some recent past period. For example, an apple price analysis on which Dr. Oldenstadt and I have worked shows how U.S. farm prices of apples for processing were related to 1) size of the crop, 2) carryover, and 3) fresh apple price during a recent period of years.

Into this type of price predicting equation, one can substitute his best estimate of the current year's situation in regard to 1) crop estimate, 2) carryover, and 3) fresh price. Then the equation can be multiplied out to obtain a predicted price. Assuming that pricing relations have not changed substantially from those that existed during the analysis period, the price analysis equation will provide a precise estimate of the price

that crop can be expected to bring. Of course, accurate price predictions depend upon accurate estimates of the price-determining factors. As you are well aware, it is sometimes difficult to accurately estimate such factors as crop size before harvest time. But then this is a problem without the use of statistical price analysis, as well as with it.

Prices which result from price-predicting equations must be interpreted and modified on a judgment basis for factors that are not included in the statistical price analysis. The effects of other factors must be estimated by subjective judgment, and the results modified accordingly. For example, if a highly successful new apple product or a series of new processed apple products are developed, these increasing effects upon price would not be adequately reflected by the historical price equation. Allowances for this type of factor must be made separately.

Nevertheless, the price analysis shows in a precise, scientific way that effects on price can be expected from such major factors as crop size and carryover. The price-determining factors in the analysis which I have been discussing explain, on the average, approximately 90% of the past changes in apple prices. This, it seems to me, indicates that it can be a useful pricing tool even though it can never be expected to explain all of the variations in price -- our market system is just too complex for that.

The example of price analysis which I have been using is an analysis of farm prices of apples for canning and freezing. I want to say something about an analysis of prices of processed apple products (sauce and slices) a little later.

Updating of Apple Analysis

But first let me talk about some recent changes in this farm apple price analysis. To be useful, any price analysis must include data for the most recent years' experience. Otherwise it quickly gets out of date and loses some of its relevance. Any price analysis which is going to be used for practical decision making must be periodically updated. My effort was primarily directed toward updating the basic work of Oldenstadt and Passour.

In this updated analysis, data were included for the most recent years (1961-1964). I also dropped the three earliest years' data from the analysis, because the results substantiated evidence that changes in the market had reduced the relevance of these earlier years. In general, I think the most recent years are the most relevant for price analysis -- although one needs to include some minimum number of years in order to establish reliable average relationships. In this regard, a superior technique might be to weight information from the more recent years more heavily than data from years in the more distant past.

Although Oldenstadt's earlier analysis indicated that there was a negative trend in farm prices of apples for canning and freezing, results of the updated analysis indicate that there is no longer a significant negative trend from year to year. Therefore, the trend factor was dropped in the uptated analysis.

The accuracy of this price-estimating equation can be evaluated by comparing the estimated prices obtained with it (using actual values of the price-

determining factors -- per capita crop, per capita carryover, and fresh apple price) to actual prices for each year in the analysis. Comparison of these actual and estimated farm prices shows that the average difference between them was about $.15 per cwt. By comparison, on the basis of my observation, it seems that the smallest common price change at the farm level is $.25 per cwt. This, it seems to me, indicates a fairly accurate pricing analysis. I should hasten to point out, however, that for some individual years the estimated price differed substantially from the actual. This was the case in 1964, for example.

Needed Refinements

I would like to mention a few refinements or changes in the price analysis that seem warranted for future analyses of apple prices. I think an analysis of prices of processed apple products such as sauce and slices would be a more useful tool to both processors and grower groups. The processed price is a big unknown that processors must look at; that is, the price at which the pack can be sold without an excessive carryover remaining. If processed apple price can be accurately predicted, farm prices can be fairly accurately predicted also. An analysis of prices of apple sauce (f.o.b. processor plants) might include 1) size of pack, 2) carryover, 3) supply or prices of other canned and frozen fruits (and possibly vegetables), 4) consumer income, 5) a measure of change in processing costs, and 6) other factors.

A major problem in developing a new price analysis, as in any price analysis, is that of obtaining an accurate series of data on all these factors. For example, it would be important in such an analysis to have a series of price data which accurately reflect sales prices -- not just list prices. The price data should reflect special arrangements, back-in sales, etc. Of course, you can see that obtaining a series of data that realistically reflect all of these factors is a real problem.

One price-influencing factor which is usually not included in statistical price analyses, because of a lack of accurate data, is that of changes in processor costs. As you processors are acutely aware, changes in processor costs are a big factor in determining the price at which you must sell to come out on a given pack. If data on this factor were available, it would probably improve the analysis to include it.

Another refinement which is probably desirable is related to the price-determining factor of fresh apple price that is in the current farm price equation. Inclusion of this factor leaves something to be desired because both fresh apple price and prices of processing apples are strongly influenced by the size of the crop and carryover conditions. Because both fresh and processing prices are influenced by some of the same major factors, it would probably be superior not to have fresh price as a variable in the analysis. Furthermore, at the time of pricing decisions for processing apples (before harvest in the main areas), fresh apple price data are based upon a rather limited number of sales in the early production areas. For this reason, data for this factor at that time of year may be somewhat questionable. However, if the early fresh price data accurately reflect year to year changes, its inadequacies are less serious. It does, however, offer an area of possible refinement.

I should point out that the current price analysis is of national average farm prices of apples for canning and freezing. As such, it does not take into account regional differences in farm prices. For example, prices of Michigan apples for canning and freezing have generally been above the national average in recent years. Separate price analyses for several of the major apple producing regions would provide useful refinements of the analysis. However, if regional differences remain fairly constant over a period of years, the U.S. average price analysis may be used as a base -- with an adjustment up or down by a factor for the regional differences.

In conclusion, I will repeat that statistical price analysis will never provide a magic formula for predicting prices with 100% accuracy. Such price analyses can, however, particularly with refinements in the data and the form of analysis, provide a useful tool for pricing and marketing decisions.

c. NEGOTIATING A PRICE AGREEMENT

HAROLD J. HARTLEY
Manager, Fruit and Vegetable Division
American Agricultural Marketing Association
(Chicago, Ill.)

We have heard an excellent discussion of a price forecasting formula. This formula has been offered as a tool -- and if I understand correctly -- it is proposed as only one tool to help arrive at the value of apples which are exchanged between a grower and a processor. During the past few years, this formula has been studied and considered but has not, in itself, provided sufficient guidance to the eastern and midwestern processing apple industry.

Basis for Negotiation

What then has been the basis for price agreement? I say agreement because basically agreement has been reached. Perhaps not absolute contentment -- but nevertheless an agreement to exchange processing apples for an offered price. We certainly agree that the formula factors -- 1) crop estimate, 2) stocks of processed apple products, 3) fresh apple price, and 4) trends -- are major indicators of processing apple prices (although the weight given to each factor in each season is debatable). But other factors which have not found a place of formula distinction are also important and of variable weight. These factors may include grower costs, grower alternatives, processor costs, processor alternatives, consumer attitudes, competitive products, national economy, market psychology, promotion and merchandising.

The areas of concern to growers and processors are:

1. Which factors are of real significance?
2. How important is each factor?
3. Who should participate in evaluating these factors?
4. How can this be done without undue strain upon a highly sensitive and vital relationship between the processor and the grower?

The AAMA, upon advice of the Apple Advisory Committee, during the past few years has followed a course which rejects attempts to force processors to meet grower requests. Attempts to force agreement invariably necessitate alternatives for disposal of fruit not delivered to processors. These alternatives might include processing of members' fruit by the association, storing of fruit to hold it from the market, disposal of fruit, diversion to approved processors -- or other methods. Past experiences have proven these alternatives usually cause a deterioration of grower-processor relationships and create problems in orderly marketing of the processed products.

The AAMA Advisory Committee has chosen a program which utilizes market analysis, price recommendations and an attempt to influence growers, processors, retail buyers and consumers to accept such recommended values. The AAMA program might be described as an effort to project an acceptable price image on the industry's mind well in advance of the actual exchange.

Our Advisory Committee each year analyzes the favorable and unfavorable factors affecting the market. These are published and given wide distribution at a reasonably early date. The association newsletters are sent primarily to growers, but are also sent to processors, retail buyers, consumers, and others in the industry. The number and importance of these favorable and unfavorable factors vary greatly from season to season.

Following analysis of these factors, it then becomes the responsibility of our Advisory Committee to evaluate the relative weight these factors have on the price recommendation. Committees of growers, one at the AAMA level and others at state and local levels, confer with processors to discuss the merits of the association's evaluation. As in any buyer-seller relationship, each party is inclined to emphasize the strong points of his position and de-emphasize the weak points. Our conference with processors have followed this course and processors have reacted normally in this exchange of views.

Past Efforts

But to be more specific, let's briefly review the past three seasons' efforts to categorize and evaluate the pluses and minuses related to the prices of apples for processing.

In 1963, the AAMA recommended a base price of $3.50/cwt for U.S. #1 Canner grade sauce apples 2 1/2" up. The AAMA Committee's recommendation was based on an evaluation of 24 factors -- 20 favorable and 4 unfavorable.

Of the favorable factors, eight were considered most significant. These were:

1. Crop estimated 6% below 1962 (August 1963 estimate was 117.9 million bu.)
2. Processing varieties were short
3. Apple products (especially sauce) carryover was down
4. Apple product prices were strong
5. Citrus was very short

6. Tart cherry crop very short

7. Pear crop down sharply

8. Processors' demand was strong

On the unfavorable side, the Committee noted that:

1. Processor costs were up

2. Cling peach crop and price was unsettled

3. Apricot price was down

In conferences with processors, there was very little exception to the factors as evaluated. Subsequently, processors offered and growers delivered fruit for $3.00/cwt - a $.50 increase over 1962. Apple sauce sold for around $3.20/cs. (24/303 P.L.) - approximately $.60/cs. above 1962. In 1963, formula price estimate was $2.53/cwt.

In 1964, the factors were not nearly so favorable to the grower position and the Committee recommended a base price of $2.50/cwt - $.50 below the 1963 prices. Eighteen major factors were listed. The unfavorable factors greatly out-weighed the favorable.

Major unfavorable factors included:

1. 17% larger crop (estimated September 1964, 145.9 million bushels)

2. Larger canner stocks of apple sauce

3. Retail buyers not in market in anticipation of low-priced new pack

4. Larger supplies and lower prices of most other fruits

5. Heavy drought with probability of smaller fruit with lower case yields

But the Committee was not completely shut out in its search for plus factors. These included:

1. Optimistic attitude of industry leaders that the crop was an opportunity crop

2. Well distributed crop

3. Apple juice market very strong

4. Citurs situation still extremely tight

5. Fresh sales looked good due to good quality and increased promotion

6. Storage facilities expanding

However, it was conceded that apple prices must be reduced. Processors agreed and offered $2.25/cwt ($.75 below 1963) for sauce varieties. Growers accepted.

The 1964-65 sauce market stabilized at $2.60-2.70/case ($.50-.60 below 1963-64 prices). The formula price in 1964 was approximately $1.51/cwt.

Growers applauded processors' willingness to recognize the practical aspects of pricing and by so doing averted a major catastrophe in 1964.

In 1965, a different mixture of variables confronted the industry. On the day the AAMA Advisory Committee sat down to sift out the favorable and unfavorable factors, news came of the California cling peach disaster. This report was added to previous reports that canning pears were down 50%, the tart cherry pack was down from 4.8 to 3.5 million cases (with a corresponding light frozen pack), and that strawberries, sweet cherries, blueberries, and plums were also in short supply.

The grower committees, reflecting on past conferences with processors, were aware that processors had placed emphasis on supplies of competing items. They, therefore, placed great importance on the extremely short supplies and the much higher FOB and retail prices of these items. In addition, the threatening harvest labor situation and increased labor costs added bullishness to growers' attitude toward price.

Due consideration was given to a heavier carryover of apple sauce and processors' anxiety regarding movement of the carryover and the new pack from a crop estimated in August at 130,600 bushels.

With these thoughts in mind, the Advisory Committee recommended a $3.00/cwt price for 2 1/2" up sauce varieties. Later action by Appalachian area growers revised the Appalachian area price recommendation to $2.75/cwt - $.50 above 1964 levels. New York and Michigan processors offered prices at or near the Association's initial recommendation and growers accepted. The Appalachian area raw product price, compared to 1964 prices, is not as yet clear in view of the size base change by major processors. Canner market reports indicate sauce began moving well at $2.90/case -- up $.30 from 1964-65. In mid-January, some processors offered sauce at $2.80/cs. and since that time, the sauce market has experienced unfortunate, unjustified, and perhaps unexplainable price gyrations. The 1965 formula price estimate was $2.08.

Summary

I have tried to indicate the wide variation in conditions and attitude each season and the necessity of a practical evaluation of each season's characteristics. Growers feel that they must share in the responsibility of guiding the industry toward raw product prices which will enable processors to move products in volume and at profitable prices. They want to do this in a manner which will permit efficient growers to earn a return on their investments comparable to the returns earned on the investments made by other segments of the industry. They want to do this in a manner which deserves processors' respect and which will prevent outside forces from getting a toehold in the production and marketing of their

products. And, they want to share this responsibility in a manner which will not cause undue strain on the highly valued and highly sensitive relationship with processors.

The price making process at the grower-processor level cannot be dismissed as a simple process -- nor one which can be easily solved by a formula or mechanical computers. Neither is it a process which one segment of the industry can arbitrarily dictate. It is a process which involves a blending of philosophies, attitudes, customs, personalities, historical practices, fears and hopes. It is complex. But in the final analysis, mutual respect, cold economics and reasoned discussion can be blended to produce a price and profits.

B. THE SPECIFIC INDUSTRY LEVEL SITUATION

1. GROWING AND SELLING TO PROCESSORS

a. APPALACHIA

H. D. ROBINSON
C. L. Robinson Corp.
(Winchester, Va.)

There are essentially three types of growers who provide apples for processing: 1) the 100% processor grower, 2) the two-way grower who has some dual purpose blocks, and 3) the grower who sends only salvage apples such as drops, culls, etc., to the processor.

Background

The origin of processing in our area is tied in with the decline of the export market. For many years we had a profitable export trade and processing plants were of use only to handle off-grade apples not suitable for export. Processing was a by-products business. But with the onset of WW II, the export market dried up. This provided a surplus of apples - which, fortunately, were suitable for processing. Plants were built or expanded to take care of this supply.

During the past ten years, many of the orchards which contributed to the processing supply have been removed or abandoned - due to old age, marginal profits, etc. At the same time, the fresh market has become more discriminating. This has meant that certain former fresh market varieties (such as Abermale Pippin, Gano, etc.) have been forced into processing. These apples have helped fill the supply gap, but they too are disappearing and are not being replanted. To compensate, processors have to one degree or another turned to growing their own fruit - from a million bushels in the case of one firm to smaller amounts.

Decline in Processing Plantings

Plantings of apples exclusively for processing use have declined rapidly over the past 10-20 years. This is due to a number of causes. First, many of the small growers who sold to processors because of their varieties were not suitable for the fresh market have gone out of business. Virginia has lost one third of its growers in the past six to seven years. Secondly, rising labor and equipment costs turned what had been generally a good deal in the 40's and early 50's (with a couple of notable exceptions) into an unprofitable one due to continual "cost of production or less" prices (again with a few notable exceptions). Prices, moreover, have dropped over a ten-year period. Consider the following opening prices for 2½" and up canner "A" varieties:

1952	$3.25	1962	$2.75
1953	4.50	1963	3.25
1954	4.50	1964	2.50
Average	$4.08	Average	$2.83

The drop has been $1.25/cwt. or over 50¢/bu. While the processing price was going down, the fresh market was relatively better, and the outlook was good because of the introduction and adoption of the poly bag, red sports, and CA storage. In view of these relationships, it is not surprising that planting of processing varieties lagged.

I believe that situation has now "jelled" to a great extent. Growers now raising apples exclusively for processing will be doing so because of a planned program. This will be a relatively new practice as opposed to the raising of apples for the fresh market. Growers in the fresh market category will use processing as an outlet for apples which are not usable for fresh purposes due to color, russet, etc., but perfectly usable for processing - with the possible exception of Red Delicious.

Why Grow Apples for Processing?

What are the arguments for growing apples for processing? There are several. First, we are generally able to get higher yields per tree or per acre. This is because (a) we can apply more fertilizer and get size, and (b) less trimming for color is needed - and thus there is more fruiting wood. Secondly, there is a lower labor cost to grow a bushel. Little hand thinning is required. There are some savings in sprays and cultural practices, and timing is not so critical. Thirdly, there is a quick and low cost sales deal. No storage or salesmen are required. Generally there is a prompt cash payment. Fourthly, it must be admitted that the major interest of most farmers is in producing and growing. They have less interest in, and knowledge of, selling. Furthermore, they usually lack the time, volume, or facilities to do a good fresh marketing job. So, unless they belong to a cooperative or custom packing deal, the easiest thing to do is simply sell to the processor.

The only major disadvantage of raising apples for processing is price. As I have mentioned earlier, there is apparently less and less actual cash returned to the grower year after year. There have been ups and downs, of course, but it seems that the ups have been less and the downs have been deeper with the passage of time. The only "good" prices have been with short crops - and you can't make money with "nothing on the shelf to sell." This alone had discouraged many prospective growers, and I am sure Secretary Wirtz has solidified their decision.

Price Establishment

Processors in our areas generally buy on a Federal inspection basis. Most processors pay for all apples received in some category except for rotten or decayed fruit. Usable apples, regardless of size, are classified and paid for according to the going price schedule - <u>if the processors have announced a price at the time of delivery</u> (this is one of the more deplorable practices used to depress prices to growers). A typical schedule would include:

#1 Canners: 2-3/4" up, 2-1/2 - 2-3/4", 2-1/2- 2-1/2"
#2 Canners: 2-1/4" up
Ciders, Culls

The Federal-State inspection supposedly takes random samples from several spots in each load to determine average grade and size for each load. This is then used to figure the average price per cwt. and subsequent value of

the load. A top price of $2.50 per cwt. for 2-3/4" apples might yield an average price of $1.90 per cwt. after sizing and grading.

All processors of sauce and hot pack slices in our area seem to invariably end up with the same announced price. On announces - and everyone else falls into line. Generally one of two big processors leads off after an appropriate game of cat and mouse, seeing who can outwait the other (at the growers expense on most occasions). Smaller processors concede that they are "no factor" and wait for a price announcement to echo.

At this point there is some deviation from the announced price. This involves such items as: furnishing of picking containers, preferential delivery schedules, paying tree run prices for drops and table rots, allowance for undersize on ungraded loads with no price penalty, hauling allowances, storage allowance, etc. These practices, of course, result in a premium to some growers at the expense of others. These are all common annual practices of nearly all processors in our area and make, to some degree, a mockery of the announced official prices.

Improving Existing Conditions

There seem to be many ways for growers to criticize processors' practices and policies, and vice versa. Each knows how the others operations could be improved.

My personal opinion is that the big shortcoming of apple processors is that they have no trade association to solve industry problems. Apple processors have a promotion organization in the Processed Apples Institute, but no industry planning association such as many groups have, and which is obviously legal. Such factors as standard grades, buying practices, grower relations, containers, etc., could be aired for industry benefit. (Even the growers have this situation solved in their horticultural societies.) This would help stabilize the industry from area to area.

An effort by such a group to further understanding of mutual problems by meeting, discussing, and working with growers on specific industry situations should in time lead to a stronger and sounder industry.

b. NEW YORK

GEORGE LAMONT*
Lamont Fruit Farm
(Albion)

The growing of processing apples in New York is concentrated in the western portion of the State. Total annual production in this area was about 15 million bushels during the 1961-62 seasons. Approximately 80% of this total, or 12 million bushels, ended up in processed form: about 6 1/2 million in sauce, 2 1/2 million in slices, and 3 million in juice.

*Prepared by Dana Dalrymple from Mr. Lamont's notes.

There are around 500 growers who produce over 5,000 bushels each. Many grow strictly for processing -- they don't want to bother with supervision, etc., even on varieties that can go fresh (and on some fresh market varieties it is possible to get higher yields). In our own business, one half of our production, or about 65,000 bu., is grown strictly for processing. This includes: 20,000 Greening, 15,000 Baldwin, 12,000 Romes, 7,200 20 oz., 7,000 Cortland, and 3,000 other. All our apples are sold through a sales cooperative.

The price-making process is as follows. The sauce price is established for the season. Class A varieties include Greenings, Baldwins, Romes, Goldens, and 20 oz. Class B varieties include McIntosh, Cortland, and Kings. The B varieties generally sell for about 50¢ less than the A varieties. In selling, a variety package is sometimes used: the processor is offered say two lots of Greenings if he will take one lot of McIntosh. The slice price is based on the sauce price. Spys receive a small premium. Slicers don't buy the whole crop unless they have to. There are ten slicers, seven or eight with dehydrofreezing equipment.

c. DISCUSSION*

The first main issue discussed was the comparative return to growers for raising fresh vs. processing apples. It was agreed that this is a difficult question to answer. No detailed cost and return records appear to be available. Moreover, the answer would vary with the degree of specialization of the grower. In the case of dual purpose varieties, it would vary with the point in the production process at which the market decision was made. A distinction must be made between growing costs and harvesting costs. The influence of varieties on yields and prices received must also be considered. With these reservations in mind, Mr. Robinson indicated that if apples were grown specifically for processing, they could be raised for 5-10% less. Mr. Lamont indicated that this difference was mitigated by relatively lower yields of the processing varieties in New York; however, he thought that the harvest cost for processing apples will be less. In total, the feeling seemed to be that the returns for processing have been slightly less than for fresh market.

The next point concerned the methods of selling and buying used in the various areas. In Appalachia, it was indicated that apples are sold on a day-to-day basis; no contracts are involved; and no price is announced. In New York, it was reported that some contracts are involved and that State law requires that apples must be priced before selling. In Michigan, growers are reasonably sure what the price will be; however, the grower seldom gets paid storage during the winter. In the northwest, cooperatives do not name a price but make a down payment and make up the difference at the end of the year; in other cases, price is announced.

A third issue concerned grading. There is at present a wide variation in grading practices between firms and regions. It was suggested that with a more uniform and widespread grading system, the basis would exist for a more complete and comprehensive reporting system (e.g. it could provide the basis for a weekly report on the volume of fruit taken in, grade variation

*This summary is based in large part on notes taken by Mr. Carl Toensmeyer of the Dept. of Agricultural Economics, University of Maryland.

between regions, etc.). However, some growers in the audience said that there was a not-inconsiderable variation in the grades that one lot of apples might receive. Mr. Johnson of Virginia Polytechnic Institute suggested that a large part of this problem might be due to variation in samples; improved methods of sampling are discussed in his talk which is presented later in the proceedings.

Finally, a number of other points were mentioned. One grower suggested that the word "salvage" be eliminated from the industry vocabulary. Another reported that the grower-processor relationship in New York the past season had been strained because of a poor bin situation and very restrictive delivery times. Yet another suggested that a much more complete processor organization was needed to that growers as a group would have someone to negotiate with.

2. PROCESSING AND SELLING TO THE WHOLESALE MARKET

a. GROWER-PROCESSOR RELATIONSHIPS

W. W. HUNT
Vice President, Production
National Fruit Co.
(Winchster, Va.)

I think that the previous speakers on this program have established beyond a shadow of a doubt that we are faced with a considerable surplus of apples in the future, the only question being the amount of surplus. So I do not think it is necessary for me to dwell upon that fact.

However, I do feel that I must dwell upon and emphasize the fact that practically all, if not the entire, surplus production is in the primary fresh market varieties that are the least desirable for processing from a yield and a quality standpoint. Inasmuch as my definition of a processing apple is any apple that can be processed, it includes the primary fresh market varieties which are least desirable for processing from a yield and quality standpoint.

It is hard for me to understand why the industry would overplant to such an extent on the primary fresh market varieties in face of a declining per capita consumption of fresh fruit and an increasing per capita consumption of processed apples. It reminds me a little bit of someone going into the buggy whip business when the automobile started coming in. However, the plantings have been made and I feel that it behooves all segments of the industry to try to find a solution for our common good.

Responsibility of Growers

The theme of this Conference is how the processing segment of the industry can solve the problem created by the primary fresh section of the industry. I feel that it is unfair that the burden of salvaging the surplus production should be put on the processing industry or that the primary processing apple growers and the processors should have to suffer the consequences of overproduction of the primary fresh varieties.

I do not think that any one segment of the industry can surmount the problem alone, but I feel that the primary responsibility for the solution of this situation rests on the shoulders of the segment of the industry that brought it about. The processing segment of the industry has already helped tremendously by increasing its usage of apples and stands ready to do more, because we are all in the same boat and when the water leaks in the primary fresh end it runs back into the processing end of the boat also. I know this to be true because my feet are now wet from the leaks in the fresh end of the boat. So the processors are just as much interested in solving this problem as anyone else.

Since about 2-1/2 times as many apples are consumed fresh as processed, a given percentage of increase in the per capita consumption of fresh apples would be about 2-1/2 times more effective than the same percentage of increase in the per person use of the processed product in solving this surplus problem. That being the case, it would seem that the first consideration towards solving this problem would be as to how to increase the per capita consumption of fresh apples. To that end we would suggest that the fresh segment of the industry get together and put all their funds in one pot and promote apples per se as a health product. Virginia apples are as healthy as Pennsylvania apples; Appalachian apples are as good in this respect as New York fruit; Eastern apples keep teeth as clean as Western. So why don't you folks in the fresh segment stop trying to sell Virginia apples at the expense of Pennsylvania; Appalachian apples to the loss of New York; and Eastern apples instead of Western; and join hands for a common good. By undertaking this joint promotional effort and by working with the processors to a greater extent than heretofore on any surplus left, I feel certain that this problem can be solved.

However, if the growers of the primary fresh varieties don't take this step to increase the per capita consumption of fresh apples and fail to cooperate with the processors, the processing industry will be forced back into the same position it was in 1940, namely a by-products or salvage industry. The Company I am associated with is in its 58th year of operation. While we started out as a by-products industry we feel that we have outgrown this and we do not want to get back into the role of a by-products plant and become a junk dealer.

Comparative Costs

To see how bad that period was I reviewed our records for 1940. The average of the York Imperials we bought that year was 59.4% per hundredweight. The cost of the other varieties averaged 46.6¢ per hundredweight. We had no definitely established price and we did not buy on a grade or a size basis. Our buyers would size up the block of fruit and offer what they thought they could get for it; it might be 40¢ a hundredweight to one grower and 60¢ to another. We had nearly as many prices as there were growers. It was an unsatisfactory way to buy or sell.

Despite the low prices for apples, fruit amounted to nearly one quarter of our direct cost on #10 Sauce. The percentages were as follows:

Apples	24.4%
Cans	32.8
Labor (at an average wage rate of 32¢ an hour)	17.9
Sugar	11.7
Plant overhead (including steam and water)	7.3
Cartons	4.8
Labels	1.1
	100%

This past season our average cost for Yorks was $2.442 per hundredweight, which incidentally was 21% more than we paid in 1964 despite the claims of some people to the contrary. The cost of other varieties last season was $2.136 per hundredweight. In contrast to 1940, these purchases were made at established prices on a grade and size basis so that every grower was paid the same price for the same grade and size fruit.

Despite the fact that we are paying five times as much for labor today as we were in 1940, twice as much for cans, about three times as much for sugar, and over four times as much for apples, apples are now our largest item of direct cost and consequently get the largest share of our sales dollar. The grower's share of our direct cost is about 10% more of the total now than it was in 1940. This is indicated in the following figures:

Apples	34.1%
Cans	26.2
Labor	15.9
Sugar	13.0
Plant overhead	7.0
Cartons	3.2
Labels	0.6
	100%

The processing industry has come a long way since 1940 and I am proud of what it has done. We have, moreover, increased our pack of apple sauce about 6 times.

Improving Working Relationships

I have stressed the necessity for a better working relationship by the growers if the processing industry is to do its part in helping to solve this problem. Here are some of the things I have in mind:

(1) Be realistic and factual in the evaluation of the size and quality of the crop and as to how it will have to be moved to the consumer. In other words, don't kid yourself and your fellow growers and don't try to give the processors a "snow job" in an endeavor to get a higher price. Some of the previous speakers have made reference to a price forecasting formula. The evaluation of the size and quality of the crop, like that made at the National Apple Institute Marketing Clinic, is the foundation on which this formula is based. There is an old saying that a house is no better than the foundation on which it is built, so let's be realistic and factual in our evaluation of the size and quality of the crop. It is vastly better to move a

large volume of apples at a slightly lower price than to move a small volume at a higher price and then later have to dump the balance of the volume at distressed salvage prices.

(2) Decide on a realistic division of your crop between the different pipelines to the consumer. Make an early committment with the processor of your choice so he will know the size job he has to do for you in handling your apples at the optimum stage of maturity for quality and yield and can plan his pack and the more effective merchandising of it. What I have reference to in this suggestion is the grower who likes to hold out his fruit with the hope of getting more money for it on the fresh market, and then when he finds that he can't do it puts pressure on the processor to increase his pack to take care of his fruit. In other words, he is trying play both the processing and fresh ends against the middle. We even have some growers in our area that I call "diaper" growers because they try to play three ends against the middle.

(3) Establish uniform grades and sizes for processing apples. Sell all processors on that basis so as to eliminate inequities and competition between areas, individual processors, and varieties. Uniform grades and sizes will also provide an accurate basis of comparison of the prices being paid in one area against another. For example, a #1 Canner in California is a far better apple than a #1 Canner in Virginia; a 2-3/4" apple in New York will yield better than a 2-1/2" in Virginia; a Golden Delicious will not give the yield of a more spherical apple.

(4) Next, in the interest of a better relationship I would suggest that you treat processors as customers. Poisoned pen bulletins and news releases will not help you to get the cooperation which you as growers need.

Lastly, if you growers expect the processing industry to help you solve your problem you have got to give the processors price protection. How would you feel if you had bought your season's supply of cartons and then found that your supplier was selling a neighbor of yours packages at half what you had paid and your neighbor was using this price saving to undercut your prices and take customers away from you? You can't expect the processors to hold an umbrella over the industry or to put a floor under your fresh fruit prices and help solve the problem of the industry unless you protect the processors. Yet, I suspect that there are growers in this very room today who have sold fruit to our competitors at half what we paid them last year, and this cheaper fruit is being used to cut our finished product prices.

Earlier, Truman Nold stated that a 10% decrease in the price of sauce at retail would result in a 50¢ decrease in the price of fruit and he called upon me to substantiate this. Since then I have gotten my slide rule repaired and I find that instead of 50¢ the decrease in the price of fruit is $1.00, or about 50% of what we paid last year. On talking to Truman about this during lunch hour I find that he meant 50% instead of 50¢. This is costing us money, and unless we can get our price structure restored before next Fall could well cost the entire industry money.

b. SELLING PROCESSED APPLES

L. W. BROWN
Vice President, Sales
National Fruit Product Co.
(Winchester, Va.)

There are diverse views about the agricultural situation. Some farm economists characterize today's situation as grim -- others point out the strong possibility of food shortages in this country within the next 20 years.

From what has been said about the apple industry here, it is apparent that there is more than one view as to the present and future situation of our industry. However, there is agreement upon the point that there will be increasing apple crops, and that apple processing is necessary to utilize a very substantial portion of this crop. There is also a growing awareness that an expanding market for processed apple products provides one of the surest ways to increase the overall utilization of apples.

The Retail Food Market

A very important segment of processed apple products are packaged for the consumer and in the main distributed to the consumer through retail food outlets. There has been an extremely sharp increase in the sales of convenience foods and it appears that there will be a further rapid growth. The largest increase has been in processed vegetables, processed fruits, and fruit juices. Sales of canned apple sauce on a per capita basis have shown a particular increase. The growth and market penetration of convenience foods has actually been so pronounced that two-thirds of all packaged products available to the housewife today did not exist ten years ago.

The battle for the consumer's stomach is an extremely aggressive one. Many modern retail food stores contain 4,000 or more items of food product alone. By no means is the apple industry the only industry interested in influencing the judgment of retail store operators to sell more of its product. Almost every group is aggressively competing -- the canned peach industry, the processed vegetable industry, the meat industry, the dairy products industry, the tobacco industry, the candy industry, and for all practical purposes every group of consequence.

The great problem in today's modern retailing of foods is to obtain floor and shelf space. It is not enough for our industry simply to have our products in retail stores. We must do all that we can to influence wider shelf displays, to secure preferred shelf position, to insure floor displays, to see that a wide variety of sizes of our major items are displayed, to see that the products are priced at the most favorable and practical retail prices, and to do all that we possibly can to increase and stimulate the sale of our finished product.

Need for Promotion

Above everything else, we must have a continually aggressive attack. Buying habits of consumers are sometimes slow to change. The effect of our promotional and sales activity must be a cumulative one, and one that will continue to enable us to sell more and more of our finished product. The Processed

Apples Institute is doing magnificent work in maintaining a constant barrage of releases to food editors of newspapers, magazines, radio and television stations, to food dieticians and others. These are accompanied with recipes and photographs and prepared in such a way as to encourage their use by these food editors.

Apple processors who have brand franchises are constantly employing modern merchandising and advertising techniques to increase their share of the market. Whether or not the apple processing industry as a whole should engage in consumer advertising is a subject that has received considerable thought in recent years and is most certainly worthy of further examination.

Marketing Considerations

There are some basic elements that should be uppermost in the mind of those interested in processing apples and processed apple products. In the first place our products compete against a large number of food products, possibly more directly against other canned fruits, but to a degree against all food items. This is a factor that we must keep uppermost in our mind. Secondly, there must be a steady and gradually increasing supply of our finished product for us to have the most effective type of aggressive salesmanship. Wide fluctuations in total packs and wide fluctuations in our selling prices should be leveled out if we are to maintain a constant aggressive marketing approach. We simply cannot turn the spigot on in the big-crop years and turn it off in the short-crop years.

Preferences for merchandise packed in one geographical area rather than another are being obliterated. All major processed apple areas now compete against almost all of the other areas with the freight on the finished product to destination the most important variable on most of our products. What happens in one area will most certainly effect the happenings in all other areas and unless there are extreme shortages, it will not take long for these changes to become nationwide.

We must continually expand our research and development of ways and means to improve the quality of existing products. We must examine every possible means in which we can make our operations more efficient, both at the growing level and at the processing level.

c. PRICE AND ORGANIZATIONAL FACTORS

J. A. HAUSER
President
Musselman Division of Pet Milk Co.
(Biglerville, Pa.)

Most of the remarks made here so far have been directed to the processing part of our industry and, in many cases, seem to reflect that the processing segment of the apple industry was not doing its part. Some in this audience take exception to the basic economic facts as they pertain to the apple industry. These facts are widely known and are not very encouraging.

Problem of Dumping

Processors do not like to be considered a salvage operation. I do not like to hear statements made that certain varieties of apples which are not good enough for the fresh markets must go into processing. Too many times it is said that apples not suitable for the fresh market can be dumped on the processors; this is exactly what happens and this does not help the image of apples in the eyes of buyers who we must sell to.

Meetings such as this are mostly attended by growers who grow primarily fresh apples. Many of these growers are afraid that the fresh market will not take all their apples, so they grow dual purpose apples which can be used either in the fresh market or for processing. There is nothing wrong with this except that many times the growers keep these apples in their storage long after the processing season is over. Then they have to either dump these apples or sell them at greatly reduced prices to small apple processing plants -- wrecking the processed market price-wise.

When these conditions exist and when there is an over supply of apples, the buyers (who have access to a great many publications, both from private organizations and from the government) can pretty well determine what the processors will have to do price-wise and what the selling price will be. They know what the storage holdings are, they know what the fresh market is doing, and they know that eventually there will be apples available to produce a lower-priced product which drags the whole market down.

It has been said here today that the fresh buyers are discriminating; I think that the buyers of processed products are more discriminating. I do not indicate that the buyers buy inferior processed products; but they can buy cheaper processed products because of the activities of the fresh market and those growers who grow apples primarily for the fresh market but are not able to sell them as such.

Certainly the buyers in the wholesale markets know what is going on in all industries such as the apple industry. They know that processors are being offered great amounts of fresh apples out of storage right not at very low prices, and they know that someone will buy these and process them into apple sauce, sliced apples, and apple juice which they will be able to buy at lower than the established going prices.

If the industry wants to stabilize prices, they have to stabilize for both fresh and for processed, and they also have to have some disciplinary action to prevent the dumping of the so-called gambling type apples into the hands of the small, unestablished type processor during February, March and April of each year. (Actually, I think the people who grow a processing crop of apples do far better financially than the ones who either grow dual purpose apples or grow mainly for the fresh market. Of course, there are exceptions to this.)

Central Organization Needed

I ask why the fresh people don't come up with one over-all organization to sell and promote both fresh and processed apples. This organization should include all segments of the industry and certainly should provide for representation according to the percentage of the crop used.

If there would be one over-all organization in the apple industry, as has been suggested and as has been recommended by highly paid consultants over the years, perhaps an efficient, organized program for promotion of both fresh and processed could be devised. Perhaps there would be some semblance of regulatory measures within the industry on a voluntary basis. Right now there are many organizations within the industry sincerely trying to do a job for the growers and for the industry, but I am quite sure that there are many duplications of efforts and wasting of monies because they are too little and too late.

It seems to me that if we are to improve the image of selling processed products to wholesale buyers we should have one central organization for our apple industry which would work toward uniformity of prices, both in the fresh market and in the processed market. This group should attempt to limit the volume of apples either going to fresh or to processed to that volume which they can effectively promote and sell. There must be some method for discipling growers and provide an incentive to those growers to grow only the finest type of fruit.

Advertising should be centralized. One central organization could control standardization of grade and quality of fruit that was permitted on the markets or even going to the processor. One organization could more effectively handle all types of public relations, legislative matters, foreign trade, and all the other myriad of problems confronting the industry.

* * *

Perhaps if there was some backbone in the apple industry and an image of solidarity and efficient organization, then perhaps the wholesale buyers would have sufficient confidence to buy and promote greater quantities of our products.

d. PACKING FOR REPROCESSING USE

WILLIAM D. JACKSON
Director of Marketing
Vacu-Dry Co.
(Emeryville, Cal.)

I represent Vacu-Dry Company, a basic dehydrator of fruits and vegetables. We maintain three plants in California and one in Washington. We maintain a very active research unit to devise new products and develop products needed by our sales organization to meet our customers' demands. We have a standard line of dehydrated products that we sell to the institutional market, and we sell to many large food manufacturing companies where our products serve as ingredients.

To develop a market for our products we usually work very closely with the research organization of large food manufacturers. It may take as long as four years, and much trial and error market testing, to develop a mutually satisfactory product. We call this the ingredient phase of our business.

The potential in this area of convenience foods is large. It is subject to the whims of the buying public and the aggressiveness in marketing of

the food manufacturer. We try to keep a number of products in the process of development at all times. Many of our products are original and are patented.

Economics are a constant problem. Our customers know their market and know that the consuming public will pay for a product in the market place. It is a relatively free flowing market and if the price of raw materials goes up, the market potential is narrowed. We face competition from similar products and processes. We face competition from other fruit items. The buying public is a very shrewd buyer. Value must be obviously inherent in the product. The buying public will only pay so much for convenience of processed foods. They can always shift to other firms of the same product, that is, canned, dehydrated, frozen, or fresh. The economics of all products are interrelated. Buyers can shift from apples to peaches and other fruits.

In my opinion, we need relatively large volumes of raw material at relatively stable prices. Unfortunately, the total tonnage of apples dehydrated is relatively small when compared with the fresh market or other combined types of processing. In the dehydration industry, fruit solids are extremely important. Some varieties are good driers as to yield per ton. Many of the excellent fresh market apples such as Delicious and McIntosh are poor driers. In our field some of the factors that lead to careful selection of varieties are yield, flavor, texture, ability to dehydrate in a manner acceptable in the finished product, and availability in large steady volume over the longest processing period. Our products are sold on very strict performance specifications.

Some of our requirements for raw material as to variety, size, keeping quality, and abundance of supply year in and year out, are at variance with the growers' views as to economics. Because we peel and core our apples, color of the mature apple is not the important factor as it is in the fresh market. The size of the apple needed for peeling may differ from the size needed for other purposes. Years ago the dried apple of 25% moisture was looked upon as a salvage business by the growers. I think even the juice market has changed its sights over the last few years as to its requirements for raw material. Raw material for our low moisture products of under 3 1/2% moisture requires quality specifications quite different from the fresh and other processors of apples. We are always able to buy raw material in small volume. But as soon as we have a successful product and put pressure on the market for large volume, we run into tremendous price problems. We look to long-range purchase agreements of stated quantities at stated prices. We must sell on this basis to our customers. We find that growers like to gamble on the fresh market and always hope to sell at the peak prices.

As a suggestion I have listed a few of the factors that I think must be solved in order to enlarge the market for dehydrated apples. They are:

1) Price stability and availability in volume.
   Long range purchase contracts vs. market prices.

2) Quality specifications to meet standards and the use of third party inspectors.

3) Variety.
   Recovery and processing. Dry away or apple solid content by varieties as a factor in price.

4) Geographical Location.
   High cost of dehydration plant and necessity to minimize movement of large fresh tonnages.
   Effective rail rates.
   Effective truck rates.

5) Development of New Products.
   Pricing out of the market because of demand on certain varieties, i.e., Delicious, Northern Spy.

In conclusion, I believe the future expansion of the wholesale market for dehydrated apples to be bright. However, until many of the problems outlined above are solved it cannot consistently compete and grow at a uniform rate.

3. RETAIL AND MILITARY MARKETS FOR PROCESSED APPLES

a. THE RETAIL MARKET

BERNARD A. STEIN
Vice President, Food Operations
Giant Food, Inc.
(Landover, Md.)

I want to begin by thanking you good apple people for inviting me to share some thought with you today. I am glad you invited me because I was forced to spend a considerable amount of time considering the good old apple -- the familiar apple -- the taken-for-granted apple. It has been a fascinating subject, one which I have continued to explore more out of interest and pleasure than as just another business chore.

The Apple in Perspective

Undoubtedly, the apple industry does face a problem of considerable proportions. My studies led me to conclude that in comparison with some others, your problem is not as serious as it might be. Consider the prune industry, for example. Imagine the job they faced in attempting to glamorize their lowly product. They had to overcome the dual problem of shriveled appearance and a reputation as nature's laxative. Hardly an appetizing image.

Consider the cranberry industry. Cranberries have been historically associated with one annual holiday -- Thanksgiving -- and a way had to be found to gain year-round acceptability for this product. Just when they were attaining a breakthrough, there was the nationwide cranberry pesticide scare. But the cranberry people were a determined and imaginative lot -- and a well-financed one too -- and they managed to bounce right back.

Compared with these and innumerable other examples, the apple industry is blessed with manifold advantages. The apple has no appearance problem to

live down. What is more attractive than a beautifully polished golden or crimson apple? Which fruit has greater or wider public acceptance than the apple? In fact, that's the joker. The apple's wide acceptability. All of us tend to take the apple for granted. So we do less than we might otherwise do to promote it.

The cranberry people, the prune people, the grapefruit people and all the others, with serious handicaps to overcome, spend lavishly to fill the newspapers and magazines and the airwaves with glamorous illustrations, clever copy and appetizing recipes. The result is that we see new products being brought out on the market every week containing these fruits as major ingredients.

Example of Apple Beverages

Commercials are constantly extolling the flavor of cranberry juice, orange juice and tomato juice. Do they taste any better than apple juice? But are we spending enough money to tell the world how good a glass of apple juice is at breakfast, or any other time?

The rage today is blended fruit drinks. Orange-pineapple. Pineapple-grapefruit. Orange and grapefruit. Does the apple have its proper share of the blend market? How many juice varieties have appleas as the basic ingredient?

Speaking of apple juice, there was a time when applejack was the all-American drink...the brandy of every red-blooded American. What ever became of it? Is there any reason why France, that grape-drinking country par excellence, should produce over 14 million gallons of apple brandy a year while the United States, which is many times larger, produces only one fourteenth as much?

And what about apple cider? How often is it promoted as a beverage? There are vast untapped promotional possibilities as a tie-in with typical American observances, such as Thanksgiving, the Fourth of July, Lincoln's Birthday, Washington's Birthday, and all the rest.

What is a better drink on a cold winter's day than a piping hot cup of good old mulled apple cider? In fact, why hasn't anyone thought of bottling cider with the spices right in it, so the housewife need do no more than heat and serve?

Yes, I believe that all of us have inadvertently let many an apple asset slide by the wayside.

Need For Long Range Planning

I believe that the answer to the problem of the apple industry is self-evident. There must be a broad agreement that the future of the industry depends on making long-range plans today. There ought to be a committment to spend the necessary funds to accomplish those long-range goals. Why not consider the establishment of a well-financed Apple Research and Promotion Board? This group could have as its goals the development of new uses for apples, and the promotion of these new developments to manufactures, bakers, wholesalers, retailers, the government, the professions and most importantly, to the housewife.

Here are just a few examples of what might be done by such a committee:

1. Capitalize on the romance of the apple. Remember, the first seduction took place with the help of the apple, in the Garden of Eden. Then there is that particularly beloved American folklore character, Johnny Appleseed. Why not have someone dressed up like Johnny Appleseed travel around the country, appearing at schools, fairs, supermarkets, anywhere he could find an audience, selling the virtues of the apple?

2. If you want a guaranteed advertising handle, combine a health angle with a picture of some kids. Why not make a grant to an impartial medical laboratory to run some tests on the beneficial effects of apples on the teeth? Perhaps this might result in the endorsement of the American Dental Society.

Along these lines, I would like to remind you of the controversy several years ago over Dr. Jarvie's book on the therapeutic value of apple cider vinegar. No one proved anything either way at that time. Perhaps it might also be worth your while to quietly sponsor an independent investigation into the therapeutic value of apples. Is there anything to the old adage, "An apple a day keeps the doctor away?" Why not find out once and for all, and if there is anything to it, why not merchandise it to the hilt?

3. Your apple group should be continually searching for new ways to employ the versatile apple. They should be constantly approaching manufactures with ideas and profitable suggestions. All too few frozen items have an apple ingredient. I am certain that there are many more possible uses of the apple in baking. Take the good old baked apple. There's an all-time favorite, but how often is it promoted? How can it be merchandised for breakfast, lunch, dinner? Can the apple be put into stews, soups, cereals, cake mixes, candies? Let's set aside old sterotyped thinking.

4. Much more could be done in the way of recipes. Check any fine cookbook, and there are literally hundreds of delicious ways to prepare apples. Why not develop a comprehensive recipe distribution program? And why not see if some of these recipes might be adopted by canners and packagers, and restaurants? Why not a national apple-cooking contest, similar to the Pillsbury bake-off?

5. One final suggestion: Why not encourage bakeries to increase the content of apples in their product. The coffee people some time ago instituted a "golden cup" award for the people who reduced the customary 50 cups to a pound of coffee to 40 cups. It made a better cup of coffee, which increased the business of the retailer, and the coffee people benefited in the process. Why not develop a similar award for manufacturers who meet certain standards of apple content in their products?

Allow me to give you an illustration. At Giant Food, we used to produce a conventional 22 oz. frozen apple pie with a content of 40% apples (9 oz.). We eventually went out of the frozen apple pie business because we couldn't compete in price pie field with the national packers. Recently, we decided to get back in the race with a prestige 47 oz. apple pie. It has a 60% apple content (27 oz.). It has three times as many apples and is a vastly better pie. We have to charge more for it, but we learned that our customers

are more than willing to pay more for a genuinely superior product. This story is not widely known, and could serve as a basis for a breakthrough in apple consumption if you would follow through on it.

* * *

As I mentioned a few minutes ago, the possibilities of the apple cannot be adequately explored in the few moments allotted to me. I view my role here today as one of the catalyst -- as an idea-sparker. My object was not to sell any particular program or solution, but to prompt you to sit back and take a fresh look at yourselves and at your industry.

You have many exciting possibilities ahead of you. I know that you will make the most of them.

b. THE MILITARY MARKET

GLENN GREEN
Chief, Fruit and Vegetable Branch
Defense Personnel Support Center
(Philadelphia, Pa.)

I would like to take a few moments of the brief time allotted to me to let you know what the Defense Personnel Support Center is, and something of its mission. The Defense Personnel Support Center is a consolidation of the Defense Subsistence Supply Center formerly in Chicago, the Defense Clothing and Textile Center formerly in Philadelphia, and the Defense Medical Supply Center formerly in Brooklyn. Our mission -- to supply the food, clothing, and medicine needed by the armed forces -- is world-wide.

We are concerned here today, of course, only with the subsistence function of our organization, and apple and apple products in particular. First let me make it clear that we do not determine what the soldier, sailor, airman, or marine eats, or the quantities of specific foods he may consume. Liken us if you will to a wholesale distributor who purchases, stores, and supplies his customers with the foods they want where and when they want it and in the quantities required. The point I want to make is that we are not in a position to promote specific products, we cannot expand consumption because this or that item is a good buy at a particular time. We may supply our customers only those products ordered by our customers, and in the quantities they order. I mention this because many times we receive pressure from industry, as well as from congressional channels, to purchase greater quantities of certain products particularly when in long supply. You can see there is precious little we can do about it other than to keep our customers informed of current conditions, economic factors, etc.

Now, what about the military market for your products. If we can use civilian per capita consumption figures as a criteria, I would have to acknowledge that militarily prospects are excellent for continued and perhaps extended usage.

You may be interested in knowing that based on fresh-weight equivalents our purchases of processed are greater than fresh apples. To give you a comparison of the military market vs. the civilian market on a per capita basis I came up with the following:

	Civilian	Military
Fresh	20.1 lbs.	20.0 lbs.
Canned	5.1	12.4
Juice	2.0	9.1
	27.2 lbs.	41.5 lbs.

In addition to the processed items I have mentioned, the military services use substantial quantities of low-moisture apple slices and instant apple sauce. There are wide fluctuations, however, in our requirements of these products. Our experience to date indicates that under normal conditions our purchases are not as large as industry would like, but that under situations like we are facing in southeast Asia today our requirements tax industry's capabilities. It is expected that during this fiscal year our purchases on a fresh-weight equivalent will equal a whopping 17 pound per capita consumption.

Before closing let me say that the military percentages I have given you are quite rough but I feel they are nonetheless fairly accurate.

II. ASPECTS OF A SOLUTION

A. CONSIDERATIONS IN INCREASING CONSUMPTION

1. PROMOTION: WHO SHOULD DO IT AND HOW

a. THE NATIONAL INDUSTRY STUDY COMMITTEE ON APPLE PROMOTION

LARRY SEAMAN
Chairman of the Committee
McKone Farms
(Clarklake, Mich.)

The National Industry Study Committee was established as a result of a resolution made at the National Apple Institute Meeting in Bedford Springs in June, 1964. The original members of the committee were selected by each of the participating organizations: the National Apple Institute, International Apple Association, Processed Apples Institute, and Washington State Apple Commission. We have met as a committee four times and have made considerable progress. First we had to quell any feeling that we were going to show partiality...that we were seriously studying the promotion of apples as a single commodity, without consideration as to variety, origin, or use.

Once this was established, we contacted one of the major advertising and public relation firms in the country and interested them in our problem. They became enthused about the promotion potential for apples. After considerable research they came up with a plan that seemed to be a workable one. This plan had three steps. I will dwell mostly on the first and the means of implementing it.

Because we expect that this program is going to be financed to a large extent by growers, and there are some 20,000-25,000 of them, education becomes our first major problem. To accomplish the job of explaining the benefits and profits of a national public relations program to this many growers is quite a difficult matter. So we put the problem to the aforementioned firm. At last committee meeting and again at the Board of Trustees meeting, they demonstrated a tool which could be used at large or small meetings of growers and which they felt would do the job. It met with overwhelming enthusiasm by all who saw it. It is a documented, illustrated sales presentation which drives home the benefits of collective national public relations efforts and the benefits which might be derived. But this tool has a price tag of $15,000. So we arrive at the first obstacle, how to raise $15,000 in an equitable way. We will undoubtedly have to try and raise this from our stronger regionals and other affiliated organizations. However, we do not anticipate that his will be a major problem.

This leads us to what is essentially the first step, a national public relations program. The program would exploit to a maximum degree (a) the many favorable research and feeding experiments we already have paid for, and (b) the many uses of the fruit itself, in an endeavor to make the apple an essential to the American way of life. This approach opens up all kinds of fields such as the utilization of food pages, television, and editorials; in fact the possibilities seem limitless and could extend over considerable time. We have a price on this program for a full scale job of approximately $300,000 a year (or that amount that we wish to buy), or roughly a one-half cent per bushel on the controlled tonnage in this country. Because of the lack of time I will not go into all the areas it will cover.

The second step is a Public Relations program supplemented by some consumer advertising.

The third step is a public relations program with a full-scale consumer advertising campaign extending throughout the entire year.

In our entire study, we have had but one purpose in mind -- to create an increase in consumer demand for all apples and all apple products -- because we feel that this is a field that cannot adequately be exploited by individual regional grower organizations or companies.

* * *

I would now like to speak for a moment as a grower, on a subject that came up yesterday regarding the new plantings and the tremendous increase in apple production shown by statistics. I think there is some misunderstanding. We are planting trees of improved strains of Delicious for one reason -- to stay in business. These trees are a capital investment, not made out of profits, but to maintain the quality of our fruit to meet our competition. Older out-of-date strains will be removed as they become unprofitable.

b. THE GROWER POINT OF VIEW

FRED P. COREY
Executive Vice President
National Apple Institute
(Washington, D. C.)

This is quite a handful of subject to properly dispose of in the limited time allotted for it. In a very broad and general summation, I could answer the first part of the challenge -- who should do it? -- with brevity which would be entirely out of keeping with my reputation and practiced definition of brevity! All of us concerned with, and having a stake in the welfare of the apple industry should do it.

The how part of the challenge is more difficult to answer -- and the who should do what becomes quite involved in this too. Since we can't possibly do justice to the subject in the few minutes allotted, I'd like to try to make just two or three points which I feel are basic to the question.

Definitions

First, just a word or two on semantics. To me, and what I shall be talking about in my initial remarks, promotion might well be described colloquially as "the whole ball of wax" of creating demand for and influencing the purchase and consumption of apples and apple products, supplemental to the product itself, its innovations and its packaging.

Within the broad term, promotion, is its technical sub-divisions of advertising, publicity and public relations, education, merchandising, trade relations, special promotions and probably some other categories. Some parts are clearly definable, such as paid media advertising -- though this, in turn, can be broken down into consumer advertising, promotion advertising, trade advertising, etc. Other categories are less clearly differentiated...like publicity, public relations, education, special promotions, etc.

For our purposes today, however, let's leave this to the promotion technicians and specialists and simply reiterate that all segments of the industry who strive to derive a livelihood and profit from the industry should assume a concern and obligation for the promotion of the products of the industry.

Personalization of Funds

Now, how to promote and who should do what, as I indicated, becomes more involved. In this, I think we need first to recognize a fundamental human characteristic. When I invest in promotion (and we are not, I think, sufficiently congnizant that it is an investment, a productive investment, just as essential as investments in labor and materials to produce and package and process), I have a natural tendency to want the investment and promotion tied as closely as possible to my product for my direct return and benefit. As a grower, I want my promotional investment to apply as directly as possible to my apples. After a buyer buys them, for fresh market or for processing, it is more difficult for me to appreciate the less direct return to me to invest in his successful and profitable marketing (albeit it is to my advantage too). As a processor, I want my promotion investment to apply to my products, and it's more difficult for me to appreciate the less direct value of promotion my competitor's apple sauce along with my own, and of apples, per se.

If I've attained good size and have a good brand identity and a good share of the market, I want to invest to hold this position, and I'm inclined to begrudge any very large amount to promote product per se. If I'm a smaller fresh or processing company, I'm inclined to feel that I need all my dollars to grow bigger and to become more competitive.

As a state or regional group of growers, having accomplished a cooperative organization and at least some degree of collective grower effort in promotion and other marketing needs, I'm inclined to begrudge the diversion and fragmentation of these funds to participate too heavily in a national effort by all growers -- where the programs are more remote to me, the efforts less concentrated to my area, the targets broader, concensus of program more difficult to achieve, and the financing more difficult to do equitably.

Similarly, this philosophy exists, I think, very naturally and justifiably, among and between most all segments of our industry...fresh vs. processed; grower vs. processor; supplier vs. service wholesaler and retailer; canner vs. freezer; canner vs. canner; allied industry vs. the industry it serves; industry organization vs. industry organization. There is nothing wrong with the philosophy. It is very normal. It is part of our competitive free enterprise system. It is part of "what makes Sammy run".

Need to Work Together

I think our greatest challenge is to accept this phenomenon, if it be such, and work with it and within it. We need to harness all the coordination of objective effort we can, without "spinning wheels" too much by fighting the philosophy and qualifying what each of us would do "if only growers would do this or processors would do that."

I think all segments of our industry are working more effectively together; and I think we'll come to appreciate the inter-dependence of all parts of our industry more and more as we work together more and more and as the competitive forces working against our whole industry accelerate our appreciation of this need.

As grower and grower organizations we have a whale of a challenge getting growers to invest more interest and concern and dollars in promotion and in developing good sound promotion programs. If I judge correctly, this is no less a problem and challenge among processors. Numbers of both are diminishing through economic attrition and consolidation.

But probably the major differences in organized effort to meet promotion challenges between growers and processors is still simply that growers and grower organizations have more numbers to deal with. This means a bigger job in getting (a) growers to appreciate needs and to cooperate, and (b) our grower organizations to apply greater effort and dollars to promotion and to "pool" a greater percentage of it for greater impact through collective effort.

I guess what I'm suggesting is that we encourage each other's efforts and contributions -- that we provide support and assistance and endorsement of our respective efforts.

Role of Grower Funding Programs

We have, as grower organizations, an increasing number of self-imposed grower operated commission and marketing order and other legislatively authorized structures to provide more, and more equitably financed, programs of promotion and other vital essentials of marketing. Just this past week, Idaho growers have established an apple commission for equitably financed and supervised promotion effort. Growers in North Carolina and Pennsylvania are again working to complete similar structures and programs. The New England growers' organization voted to increase their voluntary program assessment to .04¢ per bushel.

Fundamentally, the objective we are all seeking is expanded promotion of apples and apple products. If it is more difficult to combine grower and shipper and processor dollars into one grand overall program (and it isn't difficult to see the divergent philosophies and problems to achieving this, if indeed it is even wise to do it), let's encourage and aid in building the parts. Then worry about blending and pooling the parts, as we grow into it, gain mutual understanding and see mutual advantages and efficiencies for doing more of the job together.

One of the mutually valuable aspects of a number of our marketing order and commission type structures is that, generally, provision is made for processor and shipper representation on boards, which counsel and advise these programs. Since the dollars involved are grower dollars, it's only logical that growers maintain majority management of their own organizations. But liaison representation and counsel is equally logical and valuable. Correspondingly, representative grower liaison on processor and other non-grower marketer boards is equally valuable for better cooperation and understanding.

If, as is generally declared and accepted, the basic and primary job of apple promotion for apples per se is a grower responsibility, then all other segments of our industry ought to encourage and assist and applaud collective grower effort to achieve it.

Broad Involvement

One final point. There is another fortunate factor, I think, in collective effort for promotion. The broader the involvement, the less specific the promotion can be relative to variety or product or geographical area of production. This is good. One of the greatest voids, I feel, which we as an industry are leaving most unattended is the promotion of apples per se. Whatever the variety, wherever grown, whatever the final product (fresh, canned or frozen); wherever and however marketed (institutional, retail supermarket produce section or grocery shelf, roadside farm market, vending) the big job we do need to do better -- and cannot do as adequately and effectively by individual companies or areas of our industry -- is to tell the story of apples per se to the potential consuming public. This we can do with collective effort, and must do more of...not as a replacement for area and company promotion effort, but rather to help build a more favorable atmosphere in which areas and companies with more specifically segmented promotion can achieve more favorable results.

In our concern for what should be done let us not discredit or downgrade what is being done for our industry in the field of promotion. Individually and collectively we are doing quite a lot.

We have a product, the apple -- in all its varieties and versatilities and product forms -- which is a promoter's dream. Its potential is almost unlimited. Gentlemen, we can do this job of promotion.

c. THE PROCESSOR POINT OF VIEW

THOMAS RICKENBACK
President
Processed Apples Institute
(New York, N.Y.)

Supply and demand are truly the basic factors that govern all business. If supply increases more rapidly than the demand, the results will be a weak market, depressed prices, and potential surplus conditions. The solution to the problems in the apple industry will be to either reduce the supply or increase the demand. Obviously the latter is the important one inasmuch as we are gathered at this conference to discuss the possibilities of increasing consumer demand on apples and apple products.

A most important method for increasing demand is promotion. Fifteen years ago a group of processors in the apple field felt strong enough to start the Processed Apples Institute to create the first national program for promoting apple products. This, of course, is in addition to all of the advertising and promotions conducted by individual processors. We in P.A.I. still have a long way to go, but we are, this year, expanding our public relations program to include our trade so we can be of direct help to our customers as well as our P.A.I. members.

If through a national promotional effort is is possible to build up the demand and keep the demand ahead of the supply, it will then be possible for those involved in both fresh apples and processed products to market their products at a profitable basis. If on the other hand, the supply gets ahead of the demand it will not be a profitable picture for anyone. Last June, the Processed Apples Institute at their annual meeting had a very fine report presented by Smith Greig and Chuck Slater who demonstrated to us that the rate of increase on the production of apples is greater than the increase of demand. They pointed out very strongly that something would very definitely have to be done to avoid a surplus in the not too distant future. They also demonstrated that with equal promotion or price decline placed on fresh apples and processed apple products, greater results could be obtained in moving the processed products than the fresh.

There is little question that now is the time to plan ahead for National Promotion for the entire industry so as to avoid the potential surplus. We have a fine example to follow in citrus products. They indeed have had excellent results as we all know. We are fortunate, however, in the apple industry to have what I would consider advance notice that action must be taken, and now is the time work to move ahead.

Larry Seaman's National Apple Promotion Study Committee has been producing excellent results and if this group can succeed in setting up a strong national program on fresh apples and have funds available to put toward the processed products, I am sure that the demand can then be built up in proper proportion to increased supplies. The Processed Apples Institute, as I said before, has had fifteen years of good experience in conducting a national promotional program on processed apple products. It is our hopes that if Larry Seaman's group is successful, that the funds allocated to processed apples products can be assigned to P.A.I. to extend an existing program which is now in operation and conducted by experienced personnel. This will produce more results than running a separate program which would parallel rather than extend an existing program.

Referring again to the Slater-Greig Report of last June, their suggestion that the elasticity of demand is greater on processed products than fresh apples would indicate that during a period of extra large supplies of apples, two organizations -- one promoting fresh and the other promoting processed -- would work together, and additional funds could be allocated to the processed where more apples would be moved for dollars spent than had it been put all on fresh. This would take the strain off the fresh market and keep market prices high with strong market conditions while the additional supplies of apples were being moved through the processed channels.

A potential surplus in the apple industry is basically a problem for the growers. Processors, though they may have started business as a salvage operation in the apple industry, will not be willing to accept a salvage position in the future. This would mean that any surplus of apples would be a direct problem for the growers. This being the case, the time is <u>now</u> to get everyone working together to plan ahead so there will not be any surplus conditions. The time has come for all of us to "Dive or get off the pier".

DISCUSSION

The initial discussion centered around the matter of how to use existing organizations and how to unify or coordinate efforts. A particular problem is the different and sometimes contravening affiliations: fresh vs. processings, grower vs. processor, national vs. regional, etc.

Because of the competitive nature of the grower-processor relationships, Mr. Rickenback again suggested that it might be best to have two separate groups -- one processor, one grower -- handling promotion. He went on to point out that processors would then have three avenues of promotion at the national level: individual processor, Processed Apples Institute, and national apple promotion. In response to a question, he reported that P.A.I. had 14 members and represented about one-half of the canned pack; the organization is definitely interested in expanding membership.

Comments from the floor indicated certain doubts about having two organizations. W. E. Lins thought that having two groups would widen the breach between grower and processor. This is of great concern, he continued, because grower cannot live without processor, and vice versa. Mr. Corey added that there is a national fresh apple promotion program, but that it is not nearly as strong as it should be: "our problems are people problems".

2. CONSUMERS' PREFERENCE FOR PROCESSED APPLES

L. YVONNE CLAYTON
Special Surveys Branch
Statistical Reporting Service, USDA
(Washington, D. C.)

Previous discussions during this conference have been concerned with problems and procedures involved in getting apples from the orchard to processors, then on to the wholesale market, and finally to the retailer.

At this point I would like to make some observations on what that most important person -- the consumer -- wants in processed apples. There are many processed apple products on the market today. To name a few: Canned apples, sliced apples for pies, baked apples, packaged dried apples, apple juice, frozen apple dumplings, apple cake, strudel, turnovers, and most important of all, apple sauce. I say most important because, as you may know, roughly one-fourth of the apples find their way to processors and better than half of these are made into apple sauce.1/ Recently on the shelves of a large supermarket I found at least 12 types of apple sauce -- some combined with other fruits such as cherries, pineapple, raspberries, strawberries, and apricots; some with spices, some without; in various textures such as smooth, chunky, fine, and regular. Our concern of course is what the consumer really wants in apple sauce.

1/ Dana G. Dalrymple and Irvin C. Feustel, Recent Developments in the Production and Marketing of Apple Sauce and Slices, U. S. Department of Agriculture, Federal Extension Service, July 1965, pp. 4,5.

SRS Studies

In recent years the Special Surveys Branch of the Department's Statistical Reporting Service has been involved in several projects involving apples and their related products. In early 1963, we published a report on a super-concentrated apple juice.2/ Since that time we have conducted several taste tests in our sensory evaluation laboratory on super-concentrated apple juice. Two sets of tests were conducted, one on a juice developed by the Department's Eastern Utilization Research Laboratory and another which originated at Virginia Polytechnic Institute. The results of these tests will probably be discussed later on in the conference by others.

One of our more recent projects was a study of non-citrus fruit with emphasis on apples.3/ This was a national study and involved interviews with a cross section of approximately 2,500 homemakers. While much of the information we obtained concerns fresh apples, we did include a series of questions that gave us homemakers' use and preferences in three grade factors: Flavor, consistency or texture, and color.

Attitudes

First of all let us examine homemakers' attitudes toward the use of apple sauce and the way they most often serve it. However, you must remember these will be observations based on homemakers' opinions given in answer to questions on apple sauce in general. These answers are not the result of a specific product test.

In questioning the homemakers on converting fresh apples into apple sauce as well as their purchase of the canned or processed variety, we found that 85% of all the homemakers interviewed reported using some apple sauce in the past year, either homemade, processed, or both; 35% had used processed only; 14% homemade only; and 36% had used both. We also asked those who had purchased processed apple sauce what preference if any they had between processed and homemade: 45% said that they preferred homemade, 36% said canned, and 19% indicated that they had no preference at all.

These figures pertain to the U.S. as a whole. When we break these figures down regionally we find that more than half of the homemakers in the Northeast and North central sections of the country prefer homemade apple sauce, while roughly a third of those in the South and West prefer it processed. It would seem that the market for processed could be increased in these areas since, as we mentioned before, 85% of all homemakers interviewed said they used some type of apple sauce.

2/ E. J. McGrath and Margaret Weidenhamer, The Market Potential for Super-concentrated Apple Juice. U. S. Department of Agriculture, Marketing Research Report No. 582, January 1963, 54 pp.

3/ A preliminary report of the study has been issued: Homemakers' Use of and Opinions About Selected Fruits and Fruit Products, SRS-6, May 1965. The final report will be issued in mid-1966.

Now that we have established that there is a potential for increasing the market, let us see to what use this product has been put. Only those homemakers who said they had purchased processed apple sauce were asked how they used it. The majority said that apple sauce is served as a side dish or a dessert (with 40% or more mentioning these uses). About 12% said they used it in recipes. Here there seems to be a need for information about varied ways to use apple sauce.

Preferences

Some big questions concern preferences: What kind do they want? How should it taste and look? What consistency should it have to be most acceptable?

First, let us see why there was a preference for apple sauce that was made at home. The majority of those who indicated such a preference said they did so because they could get the taste they preferred. Of course here we are dealing with only the respondents who had purchased processed apple sauce.

In order to get a more complete picture of what you really desired, we asked all homemakers a general question: "How would you describe the way good apple sauce should look and taste?" The interviewers were instructed on the basis of the replies to this question to specifically ask color and consistency preference of all homemakers who did not volunteer this information. Homemakers were about equally divided in their taste preference with 27% preferring a sweet apple sauce and 23% wanting one that was not too sweet, not too tart. They also indicated that a medium thick, smooth apple sauce that was yellowish or light in color would be most acceptable. There was some regional variation in preferences.

In considering homemade versus processed apple sauce, we found very little basic difference in what homemakers consider good apple sauce; however, there were some slight variations in their taste and color preference. Those who preferred homemade were more likely to prefer cinnamon or other spices as a seasoning; they also were more likely to mention tan or pink as their color preference.

Fifteen percent of the American public does not use any apple sauce -- homemade or processed. The Northeast and North Central regions lag behind the other areas in the use of processed. This could be your future market.

3. APPLE PECTIN AND HEALTH*

ROBERT C. WILEY
Associate Professor of Horticulture
University of Maryland
(College Park, Md.)

Promotional activities which can point to a direct relationship between apple consumption and improved health or good health are seriously needed by our industry. To be sure, the cliche "An apple a day keeps the doctor

*Parts of this presentation include work done under contract with the U.S. Department of Agriculture and authorized by the Research and Marketing Act of 1946. The contract is being supervised by the Eastern Utilization Research and Development Division of the Agricultural Research Service.

away" is not sufficient but has influenced consumer thinking on this possibility. We now need tangible, scientifically accepted evidence that apples are superior in health attributes to competitive foods. As a case in point, one has only to look at the citrus industry to realize the impact of the health advertising on consumption.

What might be done? In retrospect, it is fair to say that there has been no organized or centrally directed program to study in depth the health capability of apple products. If there are encouraging prospects, we must bring the information out of the realm of mythology into the area of scientific proof before we can effectively and honestly sell the idea "Apples are healthy" to the American consumer.

What avenues are open? It is clear from analyses of apples that sugars, acids such as malic, citric and ascorbic and other water soluble materials show little health advantage over scores of other fruits and vegetables.

It appears to me that the only avenue left for intensive study and exciting possibilities are the cell-wall materials. This cellular material comprises 2-4% of the weight of the fresh or processed apple. The most promising phase of the cell wall from the health standpoint is pectin, which is about .5% of the fresh weight of the fruit.

Let's review the health aspects of apple pectin. Ancel Keys, 1961 (5)*, found a small but significant decrease in serum cholesterol in men fed 15 g of pectin per day. Wells and Ershoff, 1961 (6), found in rats a lowered blood cholesterol when fed pectin, whereas cellulose did not produce the same results. Fisher et al at Rutgers in 1964 (3) found retardation of spontaneous atherosclerosis in two-year old cockerels fed on a standard diet supplemented with 5% pectin for 18 months. The pectin-fed birds excreted three times as much lipid extract and almost twice as much cholesterol as nutritive fiber. From this evidence we have concluded that some aspect of pectin must be involved in the lowering of cholesterol levels in the blood and reduction of lipids in the body.

How does pectin break down in the body? We have broken apple pectin down as completely as possible into its monosaccharides, sugar acids, and their anomers (7). They are mainly α and β -D-xylose, α and β -L- arabinose, α , β - and γ -D-galactose, α and β -D-glucose and α , β , and γ -D-galacturonic acid. It is highly unlikely that xylose, arabinose, galactose, or glucose from pectin are capable of tieing up cholesterols or other toxic substances in the body but it does seem probably that galacturonic acids are involved in this mechanism.

The following rationale is used: A closely related hexuronic acid of D-galacturnnoic acid is D-glucuronic adid. Glucuronic acid has been known for years (1933) (1) as a detoxicant of foreign materials in the human body. For example in the liver, β -D-glucuronic acid + phenol gives β -phenyl-D-glucuronide which is excreted as a less toxic substance. Glucuronic acids will also combine with sterols and other alcohols. In Japan, Kayamori (4)

* This number refers to literature cited at the end of the paper.

showed improved growth responses in rats injected with glucuronic acid. Chauveau in Argentina (2) found glucuronic acid was an important constituent in Gurosan, an oral medicant given for treatment of alcoholics.

It seems clear that β -D-glucuronic acid is involved in reducing toxicity levels of certain substances in the human body. Odds are that β -D-galacturonic acid, which differs from β -D-galacturonic acid only by the position of the OH group on carbon 4, or the newly discovered γ-D-galacturonic are the active factors in pectin which lower blood cholesterols in man and reduce incidence of atherosclerosis in fowl.

I think the conclusions are obvious. We have an excellent promotional tool for apples and apple products if we can prove anomers of D-galcturonic acid are capable of conjugating toxic substances in the gastro-intestinal tract, thereby reducing cholesterols and other lipids in the human body. This will be especially germane since the edible portion of apple tissue is higher in pectin than any of the very competitive edible citrus products.

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B. EXPANDING THE MARKET WITH NEW PRODUCTS OR PROCESSES

1. NEW PRODUCTS OR PROCESSES IN DEVELOPMENT

a. WORK AT THE WESTERN REGIONAL LABORATORY

FRANK P. BOYLE
Head, Fruit Processing Investigations
Western Utilization Research and
Development Division, USDA
(Albany, Calif.)

Introduction

Over a period of many years, much of the research at the Western Regional Laboratory has involved new products and processes for apples. In addition, a considerable amount of basic research on chemical composition, enzymatic browning, and suitability of different varieties for processing has been conducted. Today I wish to discuss a half-dozen or so recent developments at the laboratory which may be of value to those in the audience who are in the apple processing business -- such things as dried flakes for instant apple sauce, gelled apple sauce, buffer treated fresh slices for pies, acid fume peeling, thick cake extraction of apple juice, and objective evaluation of flavor by means of gas chromatography. I shall not discuss some of the developments which some of you are using, such as dehydrocanned and dehydrofrozen apples, unless there are some questions on this earlier work.

Instant Apple Flakes

These low moisture fruit flakes (1/2 - 1-1/2%) reconstitute in cold water to a tasty, bright colored sauce in just a few minutes. The innovation of this process involved the modification of a standard double drum dryer to permit the directing of a stream of chilled air onto the sheet of dried sauce just before it is scraped from the drum.

After cooking, the apple sauce was fed between the rollers of the steam-heated dryer where it spread in an even film. The vapor above the drums was removed by an exhaust fan. The whole drying process took only 20 seconds in our equipment. A small quantity of sulfur dioxide was added to the sauce before drying in order to prevent browning. The take-off rolls of the dryer were run at a slower speed so that the sheet of dried material came off denser than it would have at the same speed as the web was moving.

Since the material was very hygroscopic, the take-off area was filled with dehumidified air and it was put immediately into hermetically sealed cans.

Several varieties of apples have been processed in this manner, both freshly harvested and after storage. To date the following varieties have been used to make good quality instant apple sauce: Gravenstein, Newtown, Pippin, Winesap, Rome Beauty, and Golden Delicious. The moisture content of the flakes is low enough so that they also may be used directly in dry bakery mixes.

Gelled Apple Sauce

A sauce made from Northwest Golden Delicious apples has been prepared by the addition of low-methoxyl pectin and citric acid. After peeling, coring, trimming and slicing, Golden Delicious apples from Washington were cooked and then pureed in a paddle-type pulper. Sugar, low-methoxyl pectin, citric acid, and calcium lactate were then added to the hot sauce. Heating to 190°F. and sealing into No. 303 cans completed the process. Gels with 0.9% by weight of pectin were firm enough for slicing at temperatures up to 120°F. The flavor and color of the gelled sauce were rated favorably also by members of our staff. This type of sauce could be served with pork, just as it has become customary to serve gelled cranberry with turkey.

Fresh Apple Slices

Our work on fresh apple slices is one of the best examples of which I am aware in which fundamental research has led to an immediate application. Some years ago one of our biochemists became interested in an enzyme called o-methyltransferase which could add a methyl group to an ortho phenol compound. You may say that this is very interesting but "so what." It just happens that ortho phenols are intermediate compounds involved in the browning of fruits when their cut surfaces are exposed to air, and, if one of the adjacent hydroxyl groups on the phenol can be methylated, the browning process can be stopped.

After considerably more experimentation, it was learned that by merely changing the pH of the surface of an apple slice, the browning reaction could be stopped without the addition of the enzyme. This meant that the enzyme and the other necessary components were probably present in apple tissue. Dipping of cut slices in a potassium phosphate buffer solution so that the surface pH was raised to about 8.0 proved to be sufficient to stop the browning. Changing the natural acid pH to the alkaline range proved to be optimum for the functioning of the enzyme.

In order to prevent immediate browning when the apples were sliced in air, the slices were first given a light dip in bisulfite solution (0.25%), and then soaked in a 0.20% potassium phosphate solution. This was sufficient to keep the slices light in color after several weeks of storage at 34°F.

Not only was the color improved by this treatment, but the texture and flavor were better, too. The SO_2 solution used for holding the slices temporarily was washed off by the buffer, thus improving the flavor. The slices were also more crisp, even after cold storage, than were those treated with bisulfite only. Taste panels at our Laboratory gave an 85-100% preference for the buffer treated apples over those treated with bisulfite.

It appears that this simple process could be developed commercially as a method for supplying refrigerated apple slices to the baking industry.

Acid Fume Peeling

Most methods for chemical peeling of fruits, vegetables and grains have relied on alkali (lye), but dilute hydrochloric acid has been used to remove the albedo from Mandarin orange segments. Since the outer peel or shell of many fruits, vegetables, and nuts is composed of tissues with